

A MODAL MEASURE OF ART CRITICAL DEVELOPMENT

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The study addressed the problem of the provision of objective measures for the arts, in order to provide information for national testing in art education. This involved the revision and testing of a developmental matrix and measure of art critical abilities, that had been devised in previous studies (Hickey, 1975; Stuart, 1989).

The matrix was revised to project three operational levels of development for critical abilities, that were derived from projecting key concepts through four phases of a critical or cognitive strategy. Key concepts were projected for three art functions and contextual enquiry. The modal measure was revised to provide criteria for projecting and assessing three operational levels of development for each ability.

A descriptive multi-disciplinary research strategy was used to test the objectivity of the projected matrix and measure. The testing was undertaken with thirty-one case studies derived from junior, middle and upper schools. The data was collected from children aged seven to eighteen years of age with three operational measuring instruments to test operational levels, reasoning and vocabulary.

The objectivity of the matrix was indicated by a correspondence between Piagetian operational levels and modal reasoning for three levels of development. The objectivity of

the modal measure was indicated by a triangulation of operational, modal and vocabulary scores.

The findings confirmed the previous testing in that the modal measure of the operational level of explanations provided an objective measure of art critical development.

However, differences in the level of vocabulary and reasoning could account for a partial correspondence with concrete operational levels of development.

The findings contribute to knowledge about the development of inter-disciplinary measures of the cognitive style of strategy evaluation. The information would be relevant for co-ordinating national testing in different subject areas, and for art education in particular.

AUTHOR DECLARATIONS

1. During the period of registered study in which this dissertation was prepared the author has not been registered for any academic award or qualification.

2. The material included in this dissertation has not been submitted wholly or in part for any academic qualification other than that which it is now submitted.

3. The programme of study on which this dissertation in part has consisted of is:

3.1. Attendance at Research Colloquia

3.2. Supervision Tutorials.

All of the above were held in the Centre for Postgraduate Art and Design Teacher Education in the School of Education at De Montfort University. Leicester.

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CHAPTER 1.

OBJECTIVE MEASURES AND THE ARTS.

The present study consists in the main of the revision of a replication (Stuart, 1989) of Hickey's (1975) matrix and objective measure of artistic development. Hickey's enquiry related cognitive development to the underlying cognitive and perceptual functions in critical abilities derived from art critical response. The replication study found that the matrix and measure could be applied to English education, although there were inadequacies and limitations in the matrix and measure. Therefore, a review and analysis proposed the development of a more comprehensive Modes of Reasoning Measure. This study builds on the replication study by empirically exploring and testing the validity of the matrix and measure.

A further intention is to elaborate the measure to include phases of schooling for children aged five to eighteen years of age. The revised testing involves establishing a relationship between operational development and critical thinking in art, through the vehicle of art criticism. This is in order to provide an operational measure for artistic development which would be comparable with other curriculum subjects. The National Curriculum (D.E.S., 1992) focus on the cognitive development of knowledge and understanding, indicated that enquiries into the cognitive and affective structure of art critical development would be of value for educationalists.

A descriptive research strategy is used to test the revised matrix and measure of artistic development. The first chapter considers the educational problem of co-ordinating

objective measurement in the sciences and the arts, and formulates three research hypotheses to provide an objective measure of artistic development. The second chapter contains a review of the methodologies for co-ordinating the assessment of critical thinking in different disciplines. The third chapter examines critical thinking in relation to art education. The fourth chapter describes the research design and the revised projections of the matrix and measure. The fifth chapter describes the research methodology and is followed by the hypothetical testing (Chapter six), the research findings (Chapter seven) and the research conclusions (Chapter eight).

1.1. Objectivity and the Arts.

The methodology for determining the objectivity of measures of learning development have, in the main, been derived from philosophical enquiries into objective knowledge and based on logical proof. The transfer of logical proof methodologies to the arts has been problematic. This was because non-deductive forms of hypothetical reasoning in the arts could not be reversed for the removal of error. However, agreement between relations could be used to accept or reject knowledge claims, using a 'best fit' evaluation. Therefore, in the past objective measures for the arts focus on testing the coherence or relevance of the relations for the conclusion e.g. matching aims and objectives, problems and solutions, form and meaning. Coherence testing has been less rigorous than logical proof, because it required separate tests for the removal of error (Lehere, 1974).

Coherence testing has used linguistic methods of determining agreement for a 'best fit' evaluation, rather than logical equivalence. Agreement between relations has been

measured through the subject's comprehension of the relevance of the informational support. This involved providing evidence of:

- a) a correspondence with physical reality for sense data;
- b) information that cohered with the conclusion for value judgements.

Popper (1972) extended tests of coherence to include theoretical relations and historical enquiry. This determined whether the informational support corresponded with previously established theories. Semantic analysis of statements or explanations was used to determine the relevance of informed judgements, through consensus (inter-rater agreement) and referential adequacy (scope and relevance). Explanations provided a means of determining the objectivity of logical relations, rules and principles through the structure of language (Lehere, 1974).

A main issue for linguistic measures is the validity of the methodology (Lehere, 1974; Popper, 1972). Subjective psychological measures of perception have been used to test the subject's comprehension of relevance. Perception has been related to logical relations through the use of sense data to support knowledge claims. Locke (1967) and Popper (1972) argued that critical faculties provided an independent method of corroborating the evidence, which countered subjective perceptions of physical reality or relevance. Objectivity has been provided through the cognitive functions of comprehension, critical analysis and judging.

Independent confirmation of the objectivity of perceptual measures has been difficult to establish without the measurement of physical qualities (shape, size, number, position, motion, rest). Measurement of the sensations (taste, smell, texture, sound, colour)

required a complex comparison with normal perceptions (Locke, 1967). The use of hypothetical enquiry (Russell, 1959) provided independent confirmation for sense data. Lehere (1974) argued that a shift from measurable observable qualities to measures of coherence would provide independent confirmation for sense data and value judgements. The objectivity of explanations has been independently measured through frequency counts and probability testing.

Measures of the relevance of informed judgements could be used to test the diverse critical strategies in the arts. In relation to education, Eisner (1979) and Best (1979) argued that tests of the relevance of explanations provided an objective measure of subjective and multiple perceptions for the arts. Referential adequacy allowed false information to be identified, because it demonstrated the relation between cues and the informational support. Eisner (1979) extended the argument to art critical strategies, by regarding language as a means of accessing the visual perception of images.

1.2. Objective Educational Measures.

Objective measurement in education according to Eisner (1979) was derived from psychological enquiries into the perceptual relationship between cognition and the logical or critical processes involved in understanding and organising knowledge. The methodology was justified through:

- a) the perceptual mediation of inner and outer worlds
- b) the role of logic and language in structuring thinking and making sense of the world (Piaget, 1968; Bruner, 1966).

Mental growth was related to the development of increasingly complex cognitive functions which could be mathematically sequenced to provide a common scale for measuring levels of thinking. Intellectual capacities were measured through the cognitive level of thinking that was implicit in task performance (Valett, 1978). Bloom's (1956) early example of a critical measure regarded knowledge and comprehension as lower level skills; and application (analysis, synthesis, and evaluation of merit) as higher level skills.

There were different methods of measuring critical capacities, which tended to use separate logical or linguistic tests, in order to provide standardised measures of achievement. Initial enquiries focused on quantitative measures of intelligence, and later enquiries focused on qualitative measures of reasoning development (Valett, 1978).

1.2.1. Quantitative Measures of Intelligence.

The quantitative methodology for standardising general factor tests of intelligence was derived from Galton's (1869) age related intelligence quotient. However, different perceptual factors were identified for measuring intelligence e.g. Spearman's (1923), comprehension test; Thurstone's (1938) comprehension, fluency, numeracy, spatial visualisation, memory, speed tests; Burt's (1955) verbal and mechanical tests; Vernon's (1950) verbal and spatial tests; Torrance's (Torrance and Gowan, 1963) test of multiple creative factors. Factor analysis measures often required batteries of test to assess intelligence in the sciences and the arts e.g. the Wechsler Scales (Wechsler, 1974); The Ravens Progressive Matrices (Raven 1960); Stanford Binet Intelligence Scales (Terman & Merrill, 1962); the Standard British Ability Scales (Elliot, 1983).

Ausubel's (1968) review of factor analysis measures concluded that they were objective, and had predictive value for educational achievement. The main criticism of factor analysis measures was their limited focus on low level facts for knowledge acquisition. Measures of higher level thinking required integrated tests of knowledge acquisition and their application in experiment, problem solving and debate (Eisner, 1979; Baron & Sternberg, 1987).

1.2.2. Qualitative Measures of Reasoning Development.

Qualitative measures of reasoning development focused on the cognitive style of thinking. Cognitive growth was measured through maturational changes in the methods of organising and processing information. Cognitive style methodologies assumed that the underlying cognitive differences in modes of thinking could be used to assess levels of thinking. However, there were different modal methodologies for assessing logical (Piaget, 1954) and linguistic (Bruner, 1966) development.

1.2.2.1. Operational Development.

Piaget (Piaget & Inhelder, 1958) related changes in logical operations to modes of thinking and levels of development. Operativity was related to the logical combining, sequencing and generalising of relations for classification, hypothetical deduction and logical proof. Piaget used a maturational scale of concrete and formal operations to differentiate between low and high levels of thinking. The maturational scale measured the degree of objectivity in handling logical relations, in that concrete operations were based on observation and formal operations were based on logical proofs. Piaget

considered that operations developed in hierarchical stages and were related to a particular age. The operational stages of operational development were assessed as follows.

1. The pre-operational stage (3-5 years) was characterised by unretentive thinking based on observable actions, and assessed through a lack of logically ordered relations.
2. The concrete operational stage used language to retain observed actions, and was characterised by classification, conservation, projected relations, and trial and error reasoning. Concrete operations were assessed through tests of equivalence (conservation; projected relations).
3. The formal operational stage (10-18 years) used multiple retention for theoretical thinking and was characterised by assumptions, general rules, principles and theoretical proofs. Formal operations were assessed by tests of propositional reasoning involving the manipulation of several properties.

Lunzer and Dolan's (1977) survey of Piagetian measures showed that they correlated with standardised measures and provided a reliable indication of intelligence. The main criticism of Piaget's operational measure, apart from the fixed age and stage theory, was the focus on logical relations. Donaldson (1978) and Wood (1988) criticised the lack of linguistic or semantic methods for determining the relevance of logical relations. They argued that language had a role in the comprehension of logic and critical strategies (Chomsky, 1965). Both considered that for younger children comprehending the instructions could account for poor performance in operational tests.

1.2.2.2. Linguistic Development.

Bruner's (1966) theory of cognitive growth shifted attention from logical to linguistic measures of intelligence. Bruner measured the development of language through the use of increasingly complex critical strategies for communicating culture and information. Bruner identified three modes of thinking that determined increasingly complex levels of conceptualisation for critical strategies. These were:

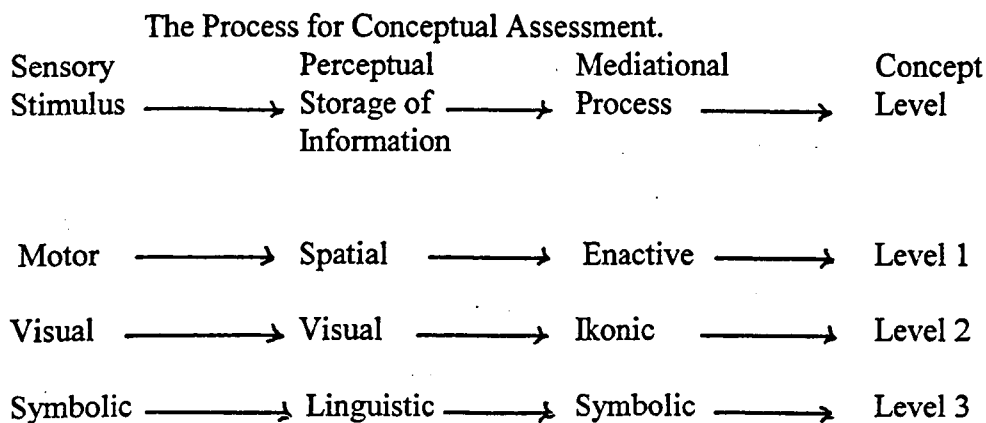
- 1) the enactive mode (5-7 years) which was characterised by physical manipulation and actions;
- 2) the ikonic mode (8-11) which was characterised by visual perception;
- 3) the symbolic mode (12-15) which was characterised by the use of logical and linguistic symbols.

Bruner's assessment of the relation between perception, mental processes and conceptualisation was clarified by Vallet (1978) as shown in Figure 1. Bruner's levels of conceptualisation were assessed through semantic analysis of the relevance of the informational support for the communication. This determined the adequacy of the strategy (Wood, 1988). Therefore, critical capacities were assessed through grammatical laws that were implicit in comprehension and the use of language e.g. attention to cues, sequencing, longer chains of inferences, going beyond observation (content dependent) by using grammatical rules and principles (Bruner, Goodnow and Austin, 1956). Bruner's linguistic methodology was derived from Chomsky's (1965) syntactical analysis of levels of language and Vygotsky's (1962) cultural, social and informational determinants on intellectual development (Wood, 1978).

Bruner's (1966) accumulative modes of thinking led to a concept of the spiral curriculum. Conceptual development was related to the development of key concepts through a variety of levels of sophistication. This allowed children to be introduced to concepts that were consistent with their mode of thinking. Bruner's linguistic measure could be applied to different disciplines to assess critical capacities through the use of relevant domain specific information. This led to a focus on the semantic structures of knowledge and critical strategies in different disciplines, to provide criterion referenced objectives for assessment (Valett, 1978).

FIGURE 1.

VALETT'S'S PERCEPTUAL LINGUISTIC ASSESSMENT OF DIFFERENT LEVELSO F CONCEPTUALISATION.



.....
(Valett, 1978, p. 83).

There were attempts to combine operational and linguistic measures of development. Lunzer (1968) identified several researchers who made a case for parallel systems of cognitive growth for mental operations and language development. These included Vernon (1950), Luria (1961), Vygotsky, (1962) Lewis (1973) and Peel (1971). Wood (1988) considered that logical and linguistic

differences in determining objectivity would undermine attempts to provide a co-ordinated measure of mental operations and language. In addition, there was evidence that language development preceded operational thinking and was used to structure relational judgements. However, Wood acknowledged that logical operational measures needed to include every-day reasoning to assess the use of subject specific information.

1.3. National Testing.

The framework for National Testing of learning in schools for children aged five to eighteen was co-ordinated through statutory requirements (Educational Reform Act, 1988). The means of co-ordinating the assessment of learning in the sciences and the arts was through an aims and objectives curriculum model, which assessed cognitive development through critical capacities. Criterion referencing was used to structure cognitive development through four key stages, for each curriculum subject. Therefore, different 'forms of knowledge', were objectively measured through their methods of critical enquiry (Peters, 1966; Hirst, 1988). Critical thinking was assumed to organise the perception of knowledge into cognitive systems of thought within and between subject areas (Bruner, 1966).

National testing has provided some educational accountability by using nationally determined objectives and tests "for national league tables" to compare achievement in schools (Dearing, 1993). Therefore, accountability appears to depend on the validity of the cognitive measure of knowledge and understanding in each subject area. However, there are a number of assessment issues to resolve

as regards the mutual consistency of the stages, as methods of determining objectivity in the sciences and the arts differed (Watkins, 1989). In addition there were different assessment procedures for key stage testing and examinations for the General Certificate of Secondary Education and the GCSE Advanced Level

1.3.1. National Key Stage Assessment.

Testing at three key stages is being undertaken for pupils aged seven, eleven and fourteen, for three core subjects (Mathematics, Science, English) and seven foundation subjects, including art. Key stage testing is through teacher assessment of criterion related performance, although core subjects are given external Standard Attainment Tests. Key stage assessment is based on the use of programmes of study to develop abilities at the end of each key stage. Attainment targets describe the skills, knowledge and understanding that require developing in each subject area. Criterion descriptors provide the means of differentiating the abilities for each key stage. (DES, 1992).

The cross subject key stage assessment is co-ordinated through the use of a ten level scale of academic performance i.e. level 2 at key stage 1; level 3/4 at key stage 2; level 5/6 at key stage 3. (D.F.E., 1995). However, in art there was insufficient knowledge of cognitive development to relate attainment to the ten level scale. Therefore, end key statements are accepted as a precise measure of progression. End key stage statements are rated at each key stage for the following three levels of sophistication: developing, achieving, working beyond (Dearing, 1996).

1.3.1.1. Key Stage Testing for Art.

Cognitive development in art is seen to be related to visual communication, through the role of perception in the conceptual understanding of visual images. Art learning is related to visual literacy, as the communication of meaning or intentions through informed judgements. These are developed and assessed through a visual analysis of the technical processes and, it might be inferred, the use of an art vocabulary with a critical strategy which broadly covers description, analysis, interpretation and evaluation. Visual communication is analysed for the student's own and others' work for a variety of functions, cultures and contexts.

Two attainment targets are used to define the abilities required for developing practical and theoretical knowledge and understanding in art, through programmes of study. Both attainment targets, as described by end key stage statements are assessed through physical or perceptual competencies according to the degree of practical skill or the appropriateness of the informed judgement in relation to the purpose or intention (DES, 1992; Dearing, 1996).

1.3.1.1.1. Attainment Target 1: Investigate and Make.

The first attainment target focuses on the development of cognition through the practical skills of making in art, craft and design. Investigation is associated with observation, research, analysing and recording from a wide range of sources to develop ideas. Making is associated with the skilful use and understanding of the

design process by selecting and controlling formal elements, tools, materials and techniques, to make images and artefacts (DES. 1992).

There are the following four subsets of descriptors for the first attainment target, which are differentiated for the key stages (D.F.E., 1995):

1. to record responses (ideas and feelings) including observations from the natural and man made environments.
2. to gather resources and materials using them to stimulate and develop ideas is divided into two subsets:
 - b) collecting source materials;
 - c) using source materials as a stimulus for their own work;
3. to explore and use two and three dimensional media, working on a variety of scales is divided into two sub-sets:
 - e) the use of tools and materials for a variety of technical processes and purposes;
 - f) the use of visual elements e.g. pattern, texture, colour, line, tone, shape form and space, to make images and artefacts;
4. to review and modify their work as it progresses for changes and developments in relation to intentions, using an art vocabulary.

The collective end key stage descriptors (D.F.E., 1995 p.9) are as follows.

Key-stage 1: pupils record ideas and feelings confidently and show a developing ability to represent what they see and touch. Resources and materials are chosen for their visual and tactile qualities to stimulate and develops ideas for their work.

They work practically and investigatively with materials, tools and techniques and work in two and three dimensions.

Key-stage 2: pupils record what they have experienced and imagined, expressing ideas and feelings confidently. This covers: representing chosen features of the physical world with increased accuracy and attention to detail; selecting relevant resources and materials and experimenting with ideas suggested by resources; the appropriate selection of materials, methods and visual elements for their intentions, making images and artefacts for different purposes and reflecting on and adapting their work, identifying ways it can be developed and improved.

Key-stage 3: pupils at this stage use technical and expressive skills in recording ideas and feelings and they show a developing ability to analyse and represent the chosen features of the natural and man made environment. They are expected to be increasingly able to research, organise and experiment with relevant resources and materials to develop their ideas. They are expected to make effective use of the characteristics of a range of materials, tools, techniques selecting from and interpreting visual elements and they modify and refine their work to realise their intentions, plan as well as make further developments, taking account of their own and others views.

1.3.1.1.2. Attainment Target 2: Knowledge and Understanding.

The second attainment target focuses on the cognitive development of visual literacy through knowledge and understanding of artists, craftspeople, designers, the history of art, our cultural heritage and a variety of artistic traditions, together with an ability to make practical connections between this and the pupils own

work. There are the following two sub-sets of criteria for assessing the second attainment target.

1. to develop an understanding of the work of artists- craftspeople- designers applying knowledge to their own artwork is divided into three subsets:

a) identifying their art forms, methods and materials;

b) recognising the use of the visual elements of images and artefacts for different purposes (ideas, feelings, meaning).

c) to recognise differences and similarities for different times and places e.g. identifying different codes and conventions from different contexts and cultures.

2. to respond to and evaluate art, craft and design including their own and others work through two subsets:

d) respond to ideas, methods or approaches for different styles and traditions for changes in style;

e) respond to (describe, express ideas, opinions) works of artists -craftspeople - designers, and explain what they think and feel about them and develop a vocabulary and ability to justify views or preferences.

The collective end key stage descriptors (D.F.E., 1995) are as follows:

Key-stage 1: pupils compare images and artefacts in simple terms. They recognise differences in methods and approaches used and make links with their own art-craft-design work.

Key-stage 2: pupils compare images and artefacts using an art-craft-design vocabulary and identify some similarities and differences in methods and approaches. They begin to recognise how visual forms are affected by their

purpose, including where appropriate the intentions and the context. They evaluate their own and others work in the light of what they intended.

Key-stage 3: pupils analyse images and artefacts using appropriate vocabulary and identify how ideas-feelings-meanings conveyed in different styles and traditions.

They compare work across time and place, recognising those characteristics that stay the same and those that change. They critically appraise their own and others work, in the light of what was intended.

1.3.2. National Examinations and Art.

National testing by examinations for pupils aged sixteen (GCSE) and eighteen ('A' level) is undertaken by several examining boards for specific subject areas. The assessment procedures are co-ordinated by a scale of grades from A to E for both examinations. The Schools Curriculum and Assessment Authority, formerly the Schools Examination and Assessment Council co-ordinated and monitored the examining bodies, through the use of general principles and subject specific criteria, to maintain comparability between examination results. However, further co-ordination is required to match the assessment procedures with the National Curriculum attainment targets and the ten level scale. (S.E.A.C., 1991; Cambridge Examining Board, 'A' level Art and Design, 1993).

The GCSE and 'A' level descriptors for art and design correspond with the National Curriculum aims and objectives model, being based on the development of cognition/perception through visual communication. However, there is a greater emphasis on a personal response and independent work. In addition, art is optional

for GCSE and 'A' level. In general there are a variety of options which include practical and/or written studies. Art options cover painting, drawing, graphics, textiles, pottery, sculpture, photography, art history, appreciation and contextual studies. The examination procedures include internal and external assessment.

1.3.2.1. The Practical Art Examination Criteria.

In general, the examining boards practical assessment criteria for GCSE are: a personal response to a theme; recording from observation and experience; sustained planning and realisation; independent working to realise intentions; research, select and analyse relevant information for thematic communication; select, control and synthesise ideas/feelings with a technical process; use visual elements in a composition; use informed contemporary and contextual responses (Northern Examining Group, 1992-93). The following criteria for advanced study give greater weighting to the cognitive processes to conceive, organise, develop and evaluate a coherent design; solve problems by analysing and exploring techniques and materials; understand the elements of a composition; develop a personal response; record from observation to develop an idea; use primary and secondary sources to communicate ideas and concepts (Joint Matriculation Board, 1988).

1.3.2.2. The Art Theoretical Examining Criteria.

In general the examining boards theoretical assessment criteria were derived from art historical and contextual approaches to art. They include a knowledge of the historical development of techniques, styles, iconography and the cultural-

contextual influences on art e.g. social conditions. The criteria for GCSE are based on a broad understanding of historical periods from a synthesis of visual details; knowledge of key features and general comparisons. Historical knowledge is gained through visual examples and background reading (London and East Anglian Group, GCSE Critical Studies, 1992).

The criteria for 'A' level assess greater conceptual knowledge and understanding and critical use of vocabulary through evidence of: a moderate factual knowledge from independent study (chronological, technical, biographical); the use of relevant sources including primary sources for ideas and themes; combined verbal and visual communication using informational support for reasons and independent judgements; discussing key issues and questioning others viewpoints (London and East Anglian Group, 'A' level Art and Design, 1992).

1.4. Statement of the Problem.

A main problem for the National Curriculum requirement for a cognitive assessment of art development is the limited research into verbal and visual forms of critical thinking and communication in art for practical and theoretical work. Further clarification is required of cognitive development and assessment in art, especially for visual literacy, in order to meet National Curriculum requirements and provide comparability with other curriculum subjects. Cognitive enquiries into aesthetic development had been regarded as inadequate or inappropriate for experiential enquiry (Eisner, 1979; Barrett, 1990; Thistlewood, 1991; Davies, 1992). In addition, cognitive enquires had focused on drawing development

(Harris, 1963) and there are fewer enquiries into visual communication for production and response. Therefore, key stage projections for visual communication require further research into the development of experiential, historical and critical enquiry (Taylor, 1986; Thistlewood, 1991; Kindler, 1992) the conceptual sequence of abilities (Barrett, 1991) and the pupils mediation of visual literacy for informing and reflecting on their own work (McAdoo, 1993).

The problem of the provision of a cognitive measure of visual communication that is comparable with other subject areas, has been addressed by a North American enquiry. Hickey (1975) used a measure of perceptual and cognitive functions to establish a significant statistical relationship between Piaget's (Piaget & Inhelder, 1958) operational levels of development, and an art critical strategy of description, analysis, interpretation and evaluation (Feldman, 1971). The critical strategy could accommodate hypothetical enquiry for deductive argument, debate and problem solving as well as affective responses for experiential enquiry.

Hickey provided a matrix and measure of three operational levels of development of art critical abilities as shown in Appendix I. Hickey's research included the following methodologies. A means of relating the following Piagetian tests (Piaget & Inhelder, 1958)

1. of the conservation of area for early concrete operations;
2. of projected relations for late concrete operations;
3. of formal reasoning for formal operations

to three levels of perceptual and cognitive functions underlying art critical abilities derived from the critical strategy.

A Critical Abilities Test to promote informed judgements for assessing:

1. the descriptive abilities which described the composition and the making of an art work;
2. the analytic abilities which analysed the structure of the composition, to provide evidence of a relation between form and meaning;
3. the interpretative abilities which generalised the meaning from the description and analysis of the artwork and related the meaning to the historical context;
4. the evaluative abilities which used categories of merit to rank an artwork.

An objective assessment of art critical abilities based on conceptual analysis of the operational level of perceptual and cognitive functions, as indicated by statements or explanations for Pepper's (1965) Utilitarian, Expressive and Formalist art functions.

Hickey' study was replicated with subjects aged thirteen years and the matrix of art critical development was found to be of value for art education in England (Stuart, 1979). However, the matrix required revising and Hickey's ambiguous operational measure required replacing by a modal measure of levels of development.

Therefore, the intention of the present study is to revise and test the matrix of art critical development and extend the modal measure to include three levels of development for children aged five to eighteen years of age.

Three hypotheses are used to test a relation between the projected matrix and modal measure with operational levels of development:

1. that art critical abilities constituted a tripartite structure, in that they can be identified at three operational levels;
2. that there is a correspondence between Piagetian operations and art critical abilities;
3. that there is an inter-correlation between:
 - a) operational levels;
 - b) acquisition of art vocabulary;
 - c) modal reasoning.

The hypotheses are based on the assumption that perception determined the cognitive levels of response (Piaget, 1968; Bruner, 1966). The framework for the objective testing of the revised matrix and measure was derived from descriptive research into multi-disciplinary measures of critical thinking, as previously described for the remaining chapters.

1.5. Summary.

Different logical and linguistic methodologies have been used to test objectivity in the sciences and the arts. It was argued that the measures were similar in that both provided evidence of a correspondence between relations and the conclusion.

However, linguistic measures lacked rigor because relations could not be reversed for the removal of error. In relation to objective educational measures different logical and linguistic methods were used for assessing cognitive development in the arts and sciences. However, the methodology for national testing of different subject areas assumed that an integrated assessment could be achieved through common levels of cognitive development.

In relation to national testing for art, there was insufficient information about cognitive development, especially for visual literacy. This problem had been addressed by the replication (Stuart, 1989) of Hickey's (1975) North American study which used art critical enquiry to provide a cognitive measure of artistic development. The replication findings indicated that the projections for art critical development and the objective measure required revising and extending to include all phases of schooling. Three hypotheses were formulated to test these revisions and formed the basis of the present study.

CHAPTER 2.

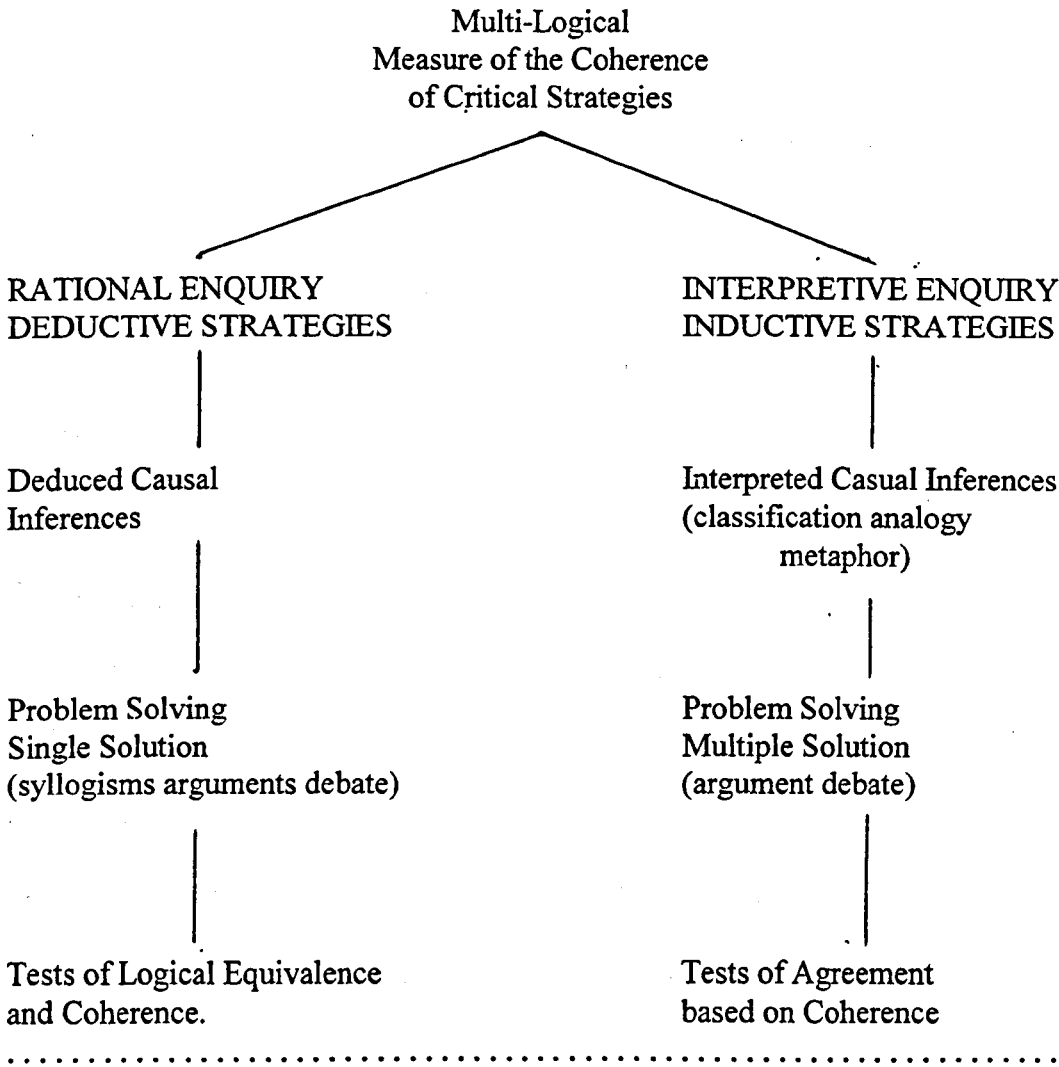
MULTI-DISCIPLINARY MEASURES OF CRITICAL THINKING.

The “Critical Thinking Movement” in education, as described and reviewed by Nesbit and Davies (1990) provided a multi-logical framework for examining the contribution of critical thinking in different disciplines to intellectual development. The multi-logical framework was derived from Bruner's (1966) post Piagetian enquiries into linguistic measures for evaluating the relevance of critical strategies and Gardner (1983) and Sternberg's (1987) theories of multiple intelligence (Paul, 1987). Multi-logical measures involved the co-ordination of logical and linguistic methodologies, in order to accommodate the diverse methods of assessing critical thinking in different disciplines e.g. elementary logic, hypothetical-deduction, debate, decision making, problem solving and creative thinking. However, there were a limited number of multi-logical measures for strategy evaluation. Sternberg's (1978) multi-logical measure co-ordinated rational and interpretive enquiry through deductive and inductive strategies as shown in Figure 2.

An imprecise definition of critical thinking was required to accommodate logical and linguistic methods of evaluating critical strategies. Nesbit and Davies (1990) identified the underlying principle of all critical processes as reflective thinking. This was related to 'higher level' thinking through the critical methods of regulating or monitoring the thinking process to validate objective judgements. Flavel's (1976) relation of reflective thinking to the meta-cognitive processes of

FIGURE 2

STERNBERG’S MULTI-LOGICAL MEASURE OF CRITICAL STRATEGIES.



Sternberg, (1987. p.337)

planning, organising and judging formed the basis of critical thinking definitions. Piaget's (1968) definition of introspection, as the logical evaluation of knowledge claims was extended to include linguistic justifications through informed decisions about beliefs and actions (Ennis, 1989 p1) or to evaluate the degree of effectiveness of different solutions (McPeck, 1981). Nesbit and McGuinness (1990) noted that multi-logical methodologies were partially compatible, but there were national differences in emphasis. European frameworks have focused on Bruner's (1966), constructivist methods of analysing the conceptual skills involved in understanding. The United States of America have focused on the relation between methods of information processing and mental processes (Sternberg, 1987) as well as philosophical methods of enquiry (Lipman, 1989; Ennis, 1987)

2.1. Inter-Disciplinary: Measures for the Arts.

The two main methods of assessing reflective criticism in the arts, are debate and problem solving. In both cases it is assumed that reflective thinking could be related to specific subject areas through the role of specific subject knowledge in developing reasoning capacities for hypothetical enquiry. The adequacy of these informal strategies, which used descriptive data and narrative argument, was evaluated through concept analysis of the relevance of casual, analogical and metaphorical relations (Sternberg, 1987).

2.1.1 Problem Solving

The relevance of problem solving methodologies is assessed through the adequacy of the solution. Bransford and Stein's (1984) problem solving model related the ability to process contextual information to: the Identification, Definition, Exploration of problems, by Acting on strategies and Looking at effects. Their problem solving strategy was assessed according to the selection of relevant information, as indicated by the clarity of the comprehension. In addition to assessing the relevance of the strategy, Sternberg (1987) used metacognitive planning and monitoring skills to measure the level of information processing through the cognitive style of processing information. Sternberg used impulsive and reflective cognitive styles to differentiate between meta-cognitive functions as:

- a) low level similarities, differences, analogies, inferences, judgements;
- b) high level organising, anticipating, questioning, formulating criteria for judging and evaluating.

The assessment criteria were based on the assumption that subjects selected cognitive styles from a wide range of alternatives that could be ranked in relation to an ideal solution (Bransford & Stein, 1984).

2.1.2 Debate

Debate is often used to assess the relevance of communication strategies through the adequacy of the communication and could include cognitive and affective responses. There are a variety of methods of assessing debate, which accommodate philosophical and interpretive enquiries. Lipman (1989) and Paul

(1987) transferred logical methods of enquiry to assess communication in the arts through a linguistic analysis of informed judgements to determine the relevance of hypothetical arguments. Lipman transferred Aristotelian logic to children's stories, whereas Paul focused on the use of subject specific information in Socratic debate. Ennis (1987) also used logical methods to determine the relevance of arguments for deductive, inductive enquiry and value judgements.

Sternberg (1987) used a measure of the methods of processing contextual information to assess the relevance of interpretive strategies. This involved measuring: knowledge acquisition as the encoding of facts, through the comprehension of attributes and concepts, from visual contextual cues embedded in the text e.g. physical properties: time and space, actions, similarities, differences; knowledge application as the appropriateness of the use of information in critical enquiry, determined by comparative analysis of the clarity of informed judgements to determine 'goodness of fit' Measures of the relevance of the communication were applied to the humanities for: law (Sternberg, 1987); history (Popper, 1972); social science (Wolf, 1978) and aesthetics (Woolf, 1981).

Paul (1987) used Sternberg's (1987) assumption that levels of processing are adjusted according to the nature of the problem, to measure the cognitive style of debate. Paul found that:

a) low level functions are indicated by subjective context dependent perceptions, from a single viewpoint based on personal experience.

b) higher level functions are indicated by independent perceptions of others viewpoints, clarity, error and the use of reasoned evidence for alternative arguments.

2.2 Transfer Issues.

A main issue for the “Critical Thinking Movement” was the use of critical thinking to integrate and monitor thinking across the curriculum (Nesbit & Davies, 1990). The two main methods of developing and assessing thinking skills were through: a) general programmes of thinking skills e.g.: Oxfordshire (1989 p.90) and Somerset (1989 p91) skills programmes, assessed through general logical rules e.g. evidential support; counter arguments, reflection and questioning; b) the critical processes inherent in subject areas e.g. questioning, problem solving, debate and decision making, and assessing subject specific knowledge through informed judgements.

However, the most effective method of developing and measuring thinking skills remained debatable, because there was a low transfer of logical rules to different contexts from general skills programmes. The poor transfer led to an interest in local knowledge and critical thinking in specific subject areas. McPeck (1981) criticised the programmes that developed critical skills independently of subject contexts. McPeck considered that differences in domain specific knowledge and critical strategies undermined the transfer of general critical skills between subject areas. Nesbit (1990) modified McPeck's position by regarding generalised and domain specific thinking skills as inter-dependent functions of transfer. The

general skills provided a useful framework for assessing critical thinking in a particular subject area.

Mc Peck also criticised the assessment focus on objectivity, in that the assessment needed to include the level of critical thinking. However, Brandt (1990) acknowledged that the assessment of critical thinking would be limited to the specific critical strategies and cognitive styles, employed in different disciplines. Parsons (1989) considered that measures of the cognitive style provided an effective evaluation of the relation between intellectual capacities and subject-specific critical abilities.

Developmental enquiries into multilogical measures provided methodologies for examining the development and assessment of critical thinking in specific subject areas. Mc Peck (1981) and Sternberg (1987) considered that critical thinking in specific subject areas involved an assessment of:

- a) an understanding of meaning, through knowledge of specific subject information, concepts, rules, principles and technical language;
- b) an understanding of the subject specific critical issues and strategies used to analyse the relevance of informational support to evaluate interpretations / solutions;
- c) the cognitive style and method of information processing.

2.3. Summary.

The multi-logical framework for assessing reflective criticism in different educational contexts was derived from philosophical and developmental methodologies. The methodologies evaluated the objectivity and the cognitive style of diverse critical strategies. Objective measures of the relevance of critical strategies for the arts were derived from problem solving and philosophical-interpretive debate. The poor transfer of general logical skills to curriculum subjects shifted attention from general measures of critical thinking to subject specific measures. Enquiries into critical thinking provided a means of examining the relation between the thinking processes and critical skills in subject specific areas.

CHAPTER 3.

CRITICAL THINKING AND ART CRITICISM.

The relation between critical thinking and critical thinking in art has been examined through the critical processes in art criticism. Critical thinking in art, in general, could be related to general critical thinking through the evaluation of interpretive strategies and the cognitive style of thinking. The framework for examining critical thinking in art may be derived from the work of the “Critical Studies Movement” in art, the evaluation of interpretative strategies, and research into the cognitive style of thinking.

3.1. The Critical Studies Movement.

Critical thinking in art has been shown to be able to be accessed through the work of the “Critical Studies Movement” in art (Kelsall, 1987; Thistlewood, 1988; Stuart, 1989) which related art critical strategies to the development of cultural communication. Artistic development has been regarded as a means of transmitting cultural values through the visual communication of ideas, beliefs and values. Interpretations of meaning have been regarded as visual communications which could be accessed through the methods of constructing meaning or visual literacy. The movement focused attention on the cultural, historical and critical aspects of art education.

The visual communications metaphor and focus on the construction and evaluation of meaning as visual messages (Gibson, 1986) allowed critical enquiry in art to be related to linguistic methods of structuring, decoding and justifying

meaning e.g. Chomsky, (1965); Bruner, (1966); Sternberg, (1987). Art critical discourse, which used language to mediated and evaluate visual perceptions, could be related to linguistic methods of classifying, interpreting and evaluating perceptual judgements, through the subject's comprehension of visual information (Reid, 1969; Broudy, 1983).

Critical thinking in art was related to the cognitive/critical processes required for an understanding of meaning and critical judgements as defined by Read (1988). Eisner (1979) and Allison (1982) regarded art criticism as a means of promoting intellectual development in art, through informed judgements and appraisals of value. The development of critical abilities and judgements through art critical methods of enquiry and an art vocabulary, were central to artistic development. Allison (1982) and Eisner (1988) outlined critical approaches to art education. Allison's four domains model for English education included expressive, perceptual, analytical-critical and historical-cultural domains. Allison (1973) recommended the integration of production and response. Eisner's Discipline Based Art Education for American education considered that production and response could be integrated through knowledge of the following disciplines:

1. art production.
2. art criticism,
3. art history,
4. aesthetics.

Knowledge of art production, history and criticism provided information for evaluating interpretations of meaning, through informed judgements. Information from art history and criticism also aided an understanding of contemporary and

contextual interpretations/evaluations of meaning (Venturi, 1964; Podro, 1982).

Popper (1972) recommended the use of 're-creative' criticism for evaluating contextual criticism and the supporting theories of the time.

3.2. Strategy Evaluation.

Methodologies that provided a multi-functional approach to strategy evaluation, as described by Pepper (1965) were derived from psychological enquiries by Feldman (1971) into an art critical strategy and mainly Reid's (1969) methodologies for the communication and validation of meaning. Both Feldman and Reid considered that art critical enquiry could be related to objective enquiry, through the systematic examination of form and meaning relations and the validation of those relations.

3.2.1. Feldman's Critical Strategy.

Feldman's (1971) previously described critical strategy was designed to develop the competencies to critically understand aesthetic values. Feldman extended art historical approaches of description classification and analysis to include a critical evaluation of interpretations of meaning. Feldman's strategy co-ordinated multi-logical evaluations of meaning e.g. deductive, communication/debate, problem solving, for Pepper's (1965) three functional categories. The critical strategy also required the use of practical and theoretical information, which could be used to integrate critical dialogue for production and response.

The critical strategy was regarded as logical in that, hypothetical interpretations of meaning were evaluated through the adequacy of causal explanations. Cause and effect relations were associated with the viewer's perception of the relation between form (the structure) and meaning (what the art work was about).

Adequate explanations related the structure to the function of the art work and the historical context. Explanations for modern artworks were related to the problem that the artwork attempted to solve. However, because of different perceptions of the structure there could be more than one adequate explanation of meaning.

Interpretations were evaluated according to pre-determined values, by ranking the degree of merit in relation to other similar works. This required knowledge of techniques, genres and styles.

3.2.2. The Interpretation of Meaning.

Reid's (1969) psychological enquiry into form and meaning relationships gave visual perceptions significance by assuming that meaning was embodied in the material forms of art and mediated by interpretation. Reid used constructionist and communication theories from literature to access the viewer's perception of the causal relation between the artist's organisation of visual relations and the meaning communicated. Structural perceptions were related to ideas and feelings through associations with the physical world and psychological states of mind.

Reid (1969) and Podro (1982) identified three categories of visual associations based on perception, which were:

- 1) sociological associations between the imitation of physical reality and contextual interpretations of meaning as a reflection of society or social comment;
- 2) psychological associations between the sensuous properties of the artwork and the artist's or spectator's emotional response for an expressive interpretation of meaning;
- 3) formal associations between the organisation of the formal qualities and interpretations of meaning as enjoyment or interest derived from the formal values of unity, balance, variety and colour.

Reid identified two main methods of interpreting meaning:

- 1) visual accounts, based on an understanding of art theories and practices i.e. styles, techniques, codes and conventions.
- 2) contextual accounts, based on an understanding of significant issues and themes in social, cultural and historical contexts.

A central issue for interpretations that related the structure to significant themes or issues and the historical context was the nature of the relationship between art and society. In order to relate art to society, it was assumed that culture was transmitted through the human involvement in producing an artwork in a particular historical context. The mediational role of the artist was supported by a theory of intentionality, in which art materials were transformed by the artist's mind (intention) into visual forms and styles that were perceived as meaningful (Reid, 1969). The concept of the artist as a mediator between art and society was used to relate art to human experience and the historical context.

An historical understanding of art was accessed through the artist's mediation of styles. Stylistic analysis was the means of identifying causal influences on the artist. However, there were psychological and ideological approaches to art historical interpretations. Venturi (1964) focused on the artist's taste as a vehicle for accessing the personal, social and historical influences on the production of an art work. However, knowledge of art history was required to relate artworks to their context i.e. country of origin; date, artists influences, private life, philosophical, religious, social and moral values as well as the social and political conditions of the time. Hauser (1959) argued for ideological forms of stylistic analysis, in order to examine the role of culture in determining beliefs. Hadjinicolaou (1982) considered that stylistic analysis of art movements provided a means of studying the history of ideas within a culture. The artist's style was regarded as a mirror of society's values, or visual- ideology, which was transmitted through the thematic elements and the artist's treatment of the subject.

3.2.3. Evaluation in Art.

Reflective criticism in art was related to the search for objective methods of validating an artworks meaning, through an adequate justification of reasoned explanations. Hypothetical discourse was required to evaluate the relative merits of interpretations of meaning. according to whether the structural explanations were relevant for the meaning i.e. agreed/disagreed with the hypothesis. Explanations were evaluated through statement or conceptual analysis, according to consensus with experts, art theories or historical evidence.

In general there were two spatial methods for evaluating the adequacy of visual relations.

1. A narrative sequencing of relations into a story or narrative argument about significant events, issues, feelings, or values was evaluated according to the relevance of the relation between the structure and the message. However, Utilitarian methodologies focused on the relevance of ideas and Expressive methodologies focused on the intensity or appropriateness of the experience (Reid, 1969). Contextual methodologies focused on the social significance of the message (Hauser, 1959; Popper, 1982), or the cognitive value of the documentary evidence for promoting a contextual understanding (Beardsley, 1982).
2. A technical sequencing of formal relations into a composition e.g. direction, movement, gradation, repetition, proximity, to evaluate aesthetic values according to the appropriateness of the relation for compositional unity (Carpenter, 1983). Formalist evaluations of significant form were accessed through the unity of the composition (Fry, 1982: Bell, 1982: Greenberg, 1982). Formalist functions could also be evaluated for technical merit according to the degree of skill or clarity (Reid, 1969).

The methodologies for evaluating the adequacy of interpretations were related to specific functions. However, as Weitz (1970) noted, no single theory provided a sufficient set of properties for functional evaluations. Therefore, evaluation in art could involve multi-functional criteria for evaluating responses to the same artwork. Brookes (1992) and Reid (1969) acknowledged the relativist nature of

evaluation in art. Brookes considered that the assessment of the subjects selection of functional criteria, depended on the degree to which functional properties, were present in an art work. Reid related the subject's selection of functional criteria to the subjects perception of the function, which was dependent on personal experience, subject specific knowledge and knowledge of methods of critical evaluation.

3.2.4. Informational Support for Explanations.

In addition to observations of the physical world and art processes, the informational support for supporting thematic and technical explanations was derived from art critical and historical sources.

3.2.4.1. Art Critical Support for Explanations.

Art critical support for explanations was derived from art theories that supported specific art functions (Brookes, 1992).

- 1) Utilitarian theories of the sociological significance of artworks provided support for explanations of art imitating life i.e. actual, imagined, ideal or spiritual.
- 2) Expressive theories of the aesthetic significance of human experience, creativity and originality provided support for explanations based on the psychological qualities of art works.
- 3) Formalist theories of significant form provided support for explanations based on the technical production of interesting or pleasing visual qualities. In addition,

justifications of technical merit based on the artist's control of materials were supported by knowledge of art techniques and processes.

3.2.4.2. Historical Support for Explanations.

Historical methods of enquiry provided documentary evidence to support contextual approaches that assumed that visual interpretations of meaning were historically determined and changed over time. The following historical methodologies were selected for relating compositional elements to an historical context.

3.2.4.2.1. Iconography.

Iconography involved supporting a visual comprehension of images with historical information to provide independent justification for themes and issues, dates and the provenance. It was assumed that literary concepts for interpretations of meaning were derived from a narrative comprehension of drawing. Literary ideas were accessed through literal, symbolic and analogical associations with the subject matter. However, iconographical codes for understanding and explaining meaning changed over time and required knowledge of the social-historical context (Panofsky, 1970). Podro (1982) criticised justifications of meaning that relied solely on the decoding of motifs. Podro argued that perceptions of meaning required knowledge of the style of representation.

3.2.4.2.2. Stylistic Analysis.

Stylistic analysis of the artwork's subject matter, composition and handling of media provided independent information for explanations which related meaning to a specific historical context through: dates, countries of origin, stylistic movements, and genres. Beardsley (1982) regarded style as a stable characteristic for relating changing modes of representation, techniques and processes to a specific historical context. Stylistic analysis involved analysing the historical influences on meaning through symbols, codes and conventions. However, Dyson (1991) noted that stylistic recognition was a complex process that had not been clarified.

3.2.4.2.3. Intentionality.

Theories of intentionality, provided justification for explanations of meaning based on the artist's character, ideas, feelings, beliefs, values, techniques and styles of representation in a particular context. Therefore, intentionalist arguments could be used to justify all of the art functions. However, intentional arguments, required informational support to provide referential adequacy for the explanation (Venturi, 1964; Podro, 1982).

3.2.4.2.4. Art History.

Art history provided informational support for justifications based on the development of art practice i.e. dates, events, stylistic movements, the artists' lives and significant art works. Dyson (1991) considered that an understanding of meaning in art was not derived purely from observation and that knowledge of art

history was essential for understanding and explaining cultural interpretations of meaning. Art historical information required knowledge of:

- 1) time concepts for relating art products to a specific historical time;
- 2) art traditions, for relating art practice to significant issues: i.e. art movements and styles, symbols, codes and conventions.

Dyson questioned whether younger children would be able to use art historical methods of investigation because of limited time concepts.

3.2.4.2.5. Contextual and Cultural Studies.

Contextual and cultural studies focused on art as a social-historical product (Woolf, 1981) and provided documentary evidence for sociological justifications of meaning. The contextual influences on the production of an artwork were examined in terms of class, gender and culture, through the viewpoints of social groups. These were identified by Hadjinicolaou (1982) as art movements and by Clarke (1982) as the social historical conditions of production, patronage, sales, art criticism and public opinion. The cultural and ideological influences on the circumstances of production were associated with the representation of beliefs values and motives.

Reid summarised the sources of background knowledge required for informed judgements as:

- 1) formalist, expressive and imitative methods of constructing meaning;
- 2) stylistic analysis of how the artist's treatment produced visual and contextual interpretations of meaning;

- 3) the interpretation and evaluation of meaning in terms of significant themes, issues or values;
- 4) documentary evidence to support visual and contextual interpretations of meaning.

3.3.. Research into the Cognitive Style of Strategy Evaluation.

The cognitive style of thinking in art was assessed through the logical and linguistic methods of evaluating interpretations of meaning from the artworks' structure, through critical dialogue. The level of thinking was related to the development of increasingly complex methods of processing visual information for concept acquisition and critical judgements. Research enquiries into the cognitive style of intellectual and conceptual development in art were derived from England and North America. However, due to the multi-functional nature of art enquiry, researchers tended to focus on different structural qualities and purposes of art.

3.3.1. English Research into the Cognitive Style of Thinking.

Allison (1988) provided a review of the Critical Studies enquiries in England into the development of art critical abilities. There were enquiries into the use of language to develop critical concepts through vocabulary (Allison, 1974; Hickman, 1986) oral and written criticism (Baker, 1983) and critical enquiry (Moloney, 1984). Statement analysis was used to assess the cognitive style of explanations by Simpson (1973); Allison (1974); Pearce,(1974); Kelsall (1978); Sherry (1983); Moloney, (1984) and Bougourd (1985). A critical strategy was

used to evaluate man made objects (Simpson, 1973; Pearce, 1974)) textiles (Bougourd, 1985) and art historical responses (Taylor, 1984).

Critical strategies were also used to develop and assess critical concepts in primary (Kelsall, 1978) and secondary schools (Sherry, 1985). Read (1984) provided a definition of critical thinking in art for examination purposes. There were investigations into the use of language to develop practical judgements by relating production and response (Kelsall, 1978) and by relating thinking skills (description, hypotheses, explanations and reflection) to craftwork (Northing, 1989). Emotive interpretations of the formal structure were investigated at primary level (Jack & Sang, 1989) and older children's poor understanding of abstract art was related to the need for information about the non -observable causes of abstract art (Moszyuska, 1990).

3.3.2. Cognitive Style Research In North America.

American enquiries into the cognitive style of the level of information processing was examined through research into developmental measures. Researchers used logical (Piaget and Inhelder, 1958) and linguistic (Bruner, 1966) methodologies to measure stages or levels of development. Arnheim (1974) Gardner (1989, 1990) and Parsons (1989) investigated operational levels of artistic development.

Arnheim and Gardner related logical growth to relational judgements of time and space in art. Arnheim identified the following increasingly complex perceptions of the structure (balance, shape, light, colour, movement) for explanations of meaning.

Stage 1: a disorganised perception of the structure;

Stage 2: parts of the structure differentiated;
Stage 3: generalisations made from the parts;
Stage 4: combining of several generalisations.

In the mid nineteen sixties' Gardner related a general logical ability to the use of classification and deductions for explanations of meaning in art. However, both Arnheim and Gardner found that logical skills were not transferable to linguistic/affective explanations of meaning, based on abstractions, metaphor, feelings, art theories and historical information. Therefore, Gardner focused on linguistic measures of communication based on the use of symbols to interpret meanings and relate them to the historical context, using Goodman,'s (1968) framework.

Parsons' operational measure accommodated the assessment of affective responses by relating Kohlberg's (1981) moral enquiry to art critical enquiry. Parsons identified the following levels of critical judgements.

Level 1: judgements based on observations of the subject matter and personal experience;

Level 2: intuitive judgements of formal qualities, codes conventions, moods, feelings, style, genre, and the social historical context;

Level 3: relevant informed judgements for different functions, based on consensus, with independent comparisons of historical meanings, opinions and norms.

Parsons concluded that explanations of historical significance did not develop until the second level and that art vocabulary was required to integrate critical enquiry and production.

Further operational enquiries into the levels of processing visual information focused on visual ambiguity (Beittel, 1988); the selection of information, determined by accuracy and novelty (Broadbent, 1958); the number of attributes (Hoschberg, 1983) and speed of processing (Gibotys & Cupchik, 1989). It was also found that emotional relations were too complex to relate to operational levels, and that lower level judgements focused on narrative and technical qualities rather than compositional unity (Gibotys & Cupchik, 1989).

Research into linguistic measures of the level of processing visual information was undertaken for stylistic and contextual enquiries. Measures of the communication of visual messages tended to focus on a stylistic analysis of the relation between the structure and ideas and feelings. Gardner's (1973) Project Zero research used stylistic analysis to investigate the methods of relating the work of artists to the children's own work. Stylistic recognition of artists and movements was derived from an analysis of the subject matter, colour, surface elements, techniques and the artist's intention to include the different methods of judging artworks i.e. techniques, ideas, feelings.

Gardner, Rosentiel, Morrison and Silverman (1978) found that explanations based on stylistic analysis could be related to the following age based stages:

1. children at age five had a limited understanding of the subject matter and colour for general comments;
2. children aged seven had a wider vocabulary which included surface qualities and some concrete explanations, with little reference to moods or messages;
3. children aged ten used realistic judgements for the evaluation of abstract and expressive works, with greater reference to techniques and art history;

4. Children aged fourteen used a variety of reasons with greater reference to artists and historical periods.

However, stylistic analysis was dominated by observations of the subject matter and techniques, with little use of rules and principles from art theories. Poor comprehension of meaning was related to the need for contextual information.

Further research into stylistic analysis found that judgements of relevance were dominated by representational value judgements (Maitland-Gholson, 1985) and that subjects could identify styles without style labels through perceptions of outline, detail, colour tone, the context and emotions (Cupchick, 1974). Realistic styles were associated with objects and abstraction with pattern (Johnson, 1985). However, enquiries by Johnson, Roybal and Parsons (1988) indicated that subjects could recognise art styles, but a metaphorical analysis of the structure required for intentions limited an understanding of meaning.

Contextual enquiries focused on narrative methodologies to measure the relevance of explanations that related the structure to social interpretations and the historical context. Narrative methodologies regarded art as a reflection of life which could be decoded from the placement of images (Stumbo, 1983). This involved an analysis of depth, distance, constancy (Blick, 1989) and conventions e.g. iconography, dress, background (Mc Gregor, 1974) supported by art historical information. However, more complex analyses were required for metaphorical associations between the structure and the artist's social feelings, values and influences (Kennedy and Simpson, 1982).

Enquiries into narrative cues used in children's drawings (Wilson and Wilson, 1987) provided the following developmental guide for contextual explanations.

Stage 1: perceptions of isolated cues for one or two objects;

Stage 2. actions sequenced for time and distance, as physical and emotive responses to happenings;

Stage 3. Sequences related to objectives and conclusions with an awareness of opposites.

Gablick (1976) also considered that art historical enquiry could be related to developmental levels.

Research into formalist measures of explanations of the relevance of techniques for the purpose was measured through problem solving strategies. Perkins (1986) examined levels of cognitive style for design processes through the level of critical analysis employed in problem solving. Critical competencies were assessed according to the ability to sequence a design process and justify decisions.

Concerns were expressed by Gebotys & Cupchick (1989) and Hochberg (1983) about methodologies that did not measure technical, physical and metaphorical analyses of the structure for a multi-functional assessment of critical capacities in art. The previously mentioned research enquiry by Hickey (1975) provided a multi-functional approach to the development and assessment of art critical abilities. Hickey's multi-functional approach was extended by the present study to examine the concepts required for understanding each function and a multi-functional measure. Zimmerman's (1983) review of research into measures of

cognitive styles for art education concluded that they provided objective measures of knowledge and understanding.

3.4. Summary.

The relation between critical thinking and art was examined through the work of the "Critical Studies Movement", the evaluation of critical strategies and research into the cognitive style of thinking. "The Critical Studies Movement" focused attention on the development and assessment of the art critical processes through a critical-historical analysis of art functions. Strategy evaluation was examined through the use of Feldman's (1971) critical strategy and Reid's (1969) structural methodologies for analysing form and meaning relationships. Enquiries into the cognitive style of thinking for assessing artistic development included enquiries by English and North American researchers. Different approaches to the assessment of stylistic, contextual and problem solving strategies were co-ordinated by Hickey's (1975) enquiry, which was extended by the present study.

CHAPTER 4.

THE RESEARCH DESIGN.

A descriptive research design was used for the hypothetical testing of a projected matrix and measure of multi-functional artistic development. The projected developmental structure of the matrix was tested with three measuring instruments using data derived from thirty-one case studies. The case studies acted as a representative sample. Walker (1980) considered that the case study was an appropriate vehicle for examining speculative projections of unexplored relations, as was undertaken in this study. The data from the case studies consisted of individual responses and provided evidence of whether:

- a) art critical abilities had a tripartite developmental structure i.e. early/late concrete, formal operations;
- b) art critical development could be related to operational levels of development;
- c) the modal measure of critical abilities was objective.

The data was collected and tested with three measuring instruments. The modal measure was used to test the operational structure of art critical abilities through evidence of responses at three operational levels. The modal measure and three Piagetian measures were used to test an operational relation, through evidence of matching test scores. Three operational measures were used to test the objectivity of the modal measure through evidence of a triangulation of test scores.

4.1. The Research Strategy.

The research strategy for projecting and testing the developmental matrix and measure was adapted from Hickey's (1975) testing of a developmental matrix of art critical abilities. The strategy involved:

- a) a reorganisation of the critical abilities in the matrix to include Reid's (1969) theories about:
 - i. visual and contextual abilities;
 - ii. relational judgements being based on three kinds of associations i.e. physical reality; psychological states, techniques;
- b) the projection of operational levels of development for each of the reorganised abilities;
- c) an elaboration of the modal measure
- d) the use of three measuring instruments to test the research hypotheses as previously described.

An independent confirmation of the test results was not undertaken. An inter-rater agreement for the Modes of Reasoning Measure was omitted due to time constraints. Tests of statistical significance to confirm an operational correspondence between test scores were omitted due to the smallness of the sample being tested. Therefore, only the internal validity of the matrix and modal measure was tested.

The adaptation of Hickey's research strategy involved a lengthy revision of the projected matrix and measure. Therefore, the revisions will be described in this

chapter, and the research procedures and measuring instruments in the following chapter (Chapter 5). There now follows a description of the reorganisation of the matrix, and the elaboration of the modal measure. Both the matrix and measure were reorganised to include:

- a) the separation of visual abilities (interpretations of meaning) from contextual abilities (relating meaning to the historical context);
- b) the identification of key concepts common to each function for a multi-functional assessment;
- c) an additional category of reflective abilities (the use of informed judgements in a critical strategy).

The reorganisation of the matrix involved a prior projection of conceptual development in art to identify the critical abilities, followed by the projection of the level of development for each ability. The operational projections for the matrix were derived from the elaborated modal measure.

4.2. The Projection of Conceptual Development in Art.

Critical abilities required for conceptual development in art were identified by projecting key concepts through Feldman's (1971) critical strategy of description, analysis, interpretation and evaluation. However, due to different analyses of visual information, separate projections were required for the development of visual and contextual interpretations of meaning. Therefore, the conceptual development of art critical abilities was described for:

- a) visual interpretations of meaning;
- b) contextual interpretations of meaning;
- c) visual and contextual evaluations of meaning.

A flow diagram of the projections for the conceptual development of art critical abilities is shown in Figure 3. There was an additional category of reflective abilities derived from Feldman's (1971) hypothetical criticism and used to co-ordinate visual and contextual interpretations/evaluations of meaning.

4.2.1. The Projections for Visual Interpretive Abilities.

The conceptual development of critical abilities was derived from relating three key concepts through description and analysis to project three structural interpretations of meaning. The three structural interpretations identified different organisational principles that united the artwork's meaning from description and analysis. These were: thematic unity for Utilitarian ideas and Expressive feelings; formalist unity for Formalist interpretations of balance, variety, harmony or the solution to a design problem. The three key concepts (Reid, 1969) were:

- a) the visual elements;
- b) the structure as the spatial organisation of meaning;
- c) the treatment as the technical organisation of meaning.

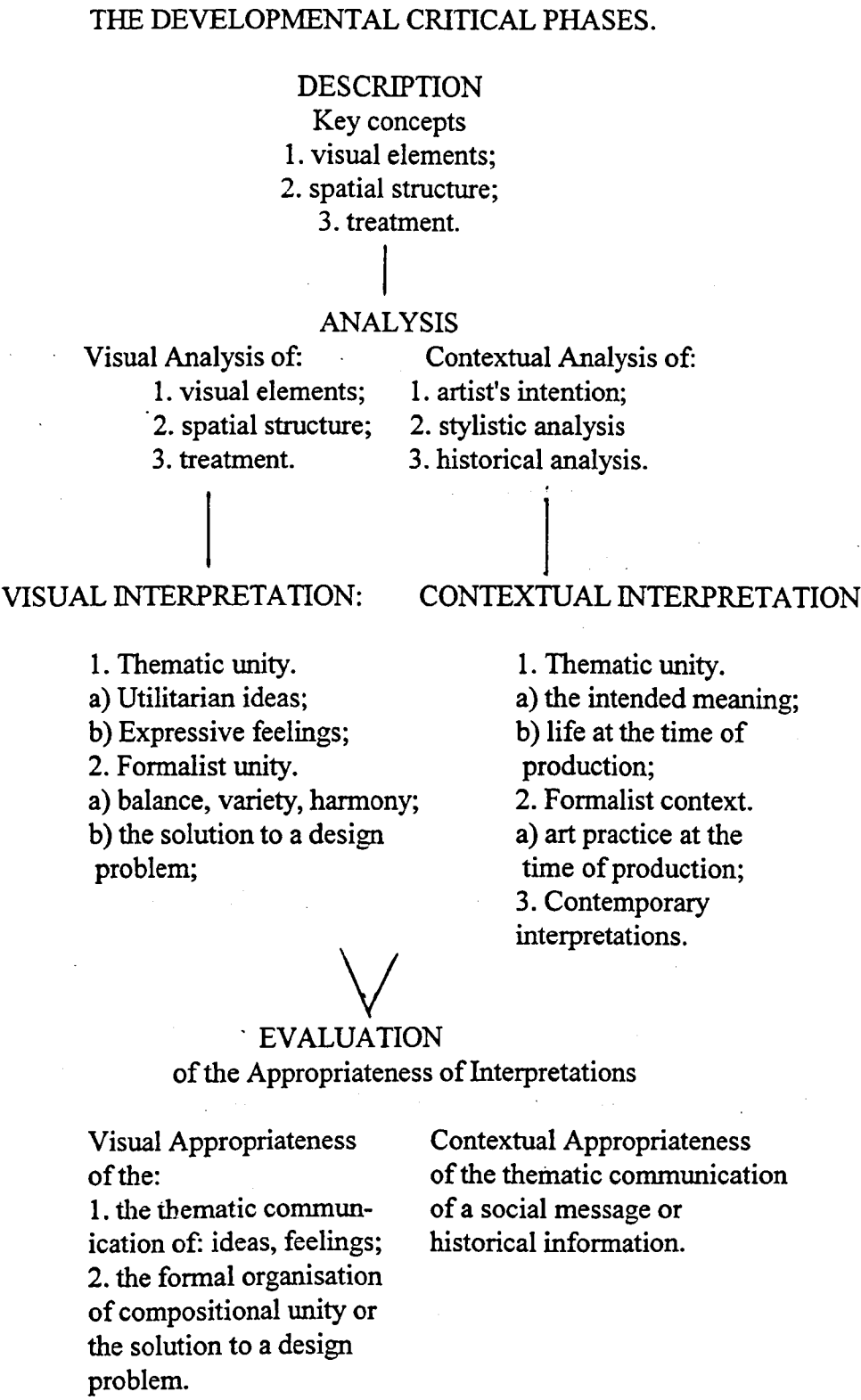
However, in order to co-ordinate the multiple-interpretations from the key concepts, there was an additional category of holistic interpretations, which led to a degree of repetition.

4.2.1.1. The Visual Elements.

The interpretation of the visual elements involved an analysis of two different sources of information i.e. the subject-matter and the formal elements.

FIGURE 3.

A FLOW DIAGRAM OF THE PROJECTION OF VISUAL AND
CONTEXTUAL CONCEPTUAL DEVELOPMENT.



4.2.1.1.1. The Subject Matter.

A description of the subject matter (people, objects and background features) through association with physical reality could be related to the following literary analyses/decoding of signs for thematic interpretations.

1. A literal analysis of items (attributes, gender, identity, status) e.g. crown/male = king, or the pictorial context e.g. landscape, for a literal perception of a theme as a narrative story.
2. A symbolic decoding of items e.g. dove of peace, and the pictorial context e.g. architectural order related to social order, for a psychological perception of a theme as an inner world of abstract ideas or thoughts.
3. An emotive decoding of items relating gesture, facial expression, pose, and movement with emotive states, and the pictorial context to moods and atmospheres, for a psychological perception of a theme as an inner world of feelings.

4.2.1.1.2. The Formal Elements.

A description of the formal elements (line, tone, texture, colour shape form) through technical associations with surface marks, could be related to the following technical analyses for interpretations of thematic and formal unity.

1. A literal analysis of the physical qualities e.g. volume, light, size, natural/un-natural colour, temperature, texture for literal perceptions of themes as an imitation of life.
2. A symbolic analysis of abstract qualities e.g. strength, softness, warmth for an analogous perception of a theme.

3. A psychological analysis of pleasing physical or abstract qualities for a technical perception of formal unity as the depiction of pleasing forms.
4. A psychological decoding of surface marks to associate colour with an emotive perception of a theme. The conceptual development of the visual elements abilities is shown in Figure 4.

4.2.1.2. The Spatial Structure.

A description of the structural organisation of the visual elements was restricted to naming the position of items, which could be described in two e.g. left, right, top bottom or three dimensional terms e.g. near, far. There were the following analyses of the artist's methods of uniting visual relations (Dubery & Willat, 1983).

1. A spatial analysis of three dimensional methods of projecting real space e.g. orthographic, isometric, perspective, which led to a narrative perception of themes as events, actions or a stories in real space or an analogous thematic perception of an abstract design.
2. A spatial analysis of schematic methods of making spatial links e.g. arrangements (overlap, juxtaposition), the focal point (importance, main things), a colour scheme, rhythm/ movement, led to a perception of formal unity as a united, varied and well balanced composition. Compositional unity was also used for interpreting solutions to design problems.
3. An analysis of distorted relations led to an emotive perception of a theme. The conceptual development of the structural abilities ia shown in Figure 5.

FIGURE 4.

THE CONCEPTUAL DEVELOPMENT OF THE VISUAL ELEMENTS
(SUBJECT-MATTER AND FORMAL ELEMENTS)

ABILITIES.

A). SUBJECT MATTER ABILITIES.

DESCRIPTION	LITERARY ANALYSIS	INTERPRETATION
1i. to name items.	1i. to decode items and the pictorial context in literal terms;	1i. to associate subject-matter with a literal perception of a theme; as a narrative story;
	1ii. to decode symbols from literal sources;	1ii. to associate subject matter with a symbolic perception of a theme as abstract ideas and issues;
	1ii. to infer thoughts from the images;	
	1 iii. to infer emotions from images and background features.	1iii. to associate the subject matter with an emotive perception of a theme as feelings moods or atmosphere.

.....

B) FORMAL ELEMENT ABILITIES.

DESCRIPTION.	TECHNICAL ANALYSIS	INTERPRETATION.
2i.to name the formal qualities.	2i.to make a literal decoding of the physical qualities of surface marks by identifying texture;	2i.to associate physical qualities with a literal perception of of a theme as an imitation of life.
	2ii. to make a symbolic decoding of the abstract qualities of surface marks.	2ii.to associate abstract qualities with an analogous perception of a theme.
	2iii. to decode pleasing physical and abstract qualities;	2iii.to associate pleasing forms with compositional unity.
	2iv.to make a psychological decoding of the emotive qualities of surface marks, through colour associations.	2iv. to associate emotive qualities with an emotive perception of of a theme.

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4.2.1.3. The Technical Treatment.

A descriptive naming of tools and materials was used for a technical analysis of techniques and processes, which related the technical production of meaning to interpretations of thematic or formal unity. Greater differentiation of the technical production was achieved through stylistic analysis of the manner of working. The following analyses of four treatments were selected to represent a wide range of styles and genres.

1. A thematic analysis of a realistic treatment as an imitation of life for inferring the life imitated.
2. A thematic analysis of an emotive treatment as the embodiment of feelings, for interpreting the emotions communicated.
3. An analysis of an abstract treatment as the formal means of uniting the composition e.g. interesting designs, or as a solution to a design problem.
4. An analysis of decorative treatment as the production of pleasing qualities to infer the pleasing qualities communicated for thematic and formal unity.

The analysis also included the differentiation of observed and imagined treatments. The conceptual development of the technical-treatment abilities is shown in Figure 6. The relation between the content analysis of the three key visual concepts and specific art functions is shown in Figure 7.

FIGURE 5.

THE CONCEPTUAL DEVELOPMENT OF STRUCTURAL ABILITIES.

STRUCTURAL ABILITIES.

DESCRIPTION	SPATIAL ANALYSIS	INTERPRETATION
3i. to describe the position of the visual elements.	3i. to identify schematic links as: a) arrangements; b) focal points; c) colour schemes d) movement. 3ii.to identify realistic spatial projections. 3iii. to identify distorted spatial relations.	3i. to associate the spatial organisation with: a) structural unity as variety , balance; b) the solution to a design problem. 3ii. to associate real-space with: a) a narrative perception of a theme; b) an analogous interpretation of an abstract design. 3iii.to associate distortion with an emotive perception of a theme

FIGURE 6.

THE CONCEPTUAL DEVELOPMENT OF THE TREATMENT ABILITIES (THE TECHNICAL PROCESS AND MANNER OF WORKING).

TREATMENT ABILITIES: 1)THE TECHNICAL PROCESSES.

DESCRIPTION	TECHNICAL ANALYSIS	INTERPRETATION
4i. to name the materials tools, medium from the surface marks.	4i. to identify the technical processes.	

TREATMENT ABILITIES: 2) MANNER OF WORKING.

DESCRIPTION	TECHNICAL ANALYSIS	INTERPRETATION
	5i to identify a realistic treatment;	5i.to infer the 'life' imitated: a. story/theme; b. issues/ideas/beliefs;
	5ii. to identify an emotive treatment;	5iii. to infer the emotions communicated.
	5iii. to identify an abstract treatment	5iii. to infer: a) a united composition; b) The solution to a design problem;
	5iv. to identify a decorative treatment communicated;	5iv. to infer the pleasing qualities
	5v. to differentiate between recorded and imaginative depictions.	

FIGURE 7

THE RELATION BETWEEN CONTENT ANALYSIS AND UTILITARIAN, EXPRESSIVE
FORMALIST INTERPRETATIONS

CONTENT ANALYSIS UTILITARIAN VISUAL ELEMENTS	CONTENT ANALYSIS EXPRESSIVE	CONTENT ANALYSIS FORMALIST.
a literal or symbolic decoding of the subject matter	an emotive psychological decoding of visual elements	a technical decoding of visual elements literal and psycho- logical.
STRUCTURE a spatial analysis of three dimensional and schematic relations.	an emotive analysis of three dimensional and schematic relations.	a spatial/technical analysis of three dimensions and schematic relations.
TREATMENT a technical analysis of the production of observations/ideas	a technical analysis of the production of feelings	a technical analysis the production of abstract designs.
UTILITARIAN INTERPRETATION	EXPRESSIVE INTERPRETATION	FORMALIST INTERPRETATIONS.
a) an imitation of life b) the communication of ideas, beliefs, values.	a) the communica- tion of emotions.	a) a united composition e.g. pleasing or interesting qualities; b) the solution to a design problem c) analogous. themes.

4.2.1.4. The Critical Abilities for Holistic Interpretations.

In practice, interpretative judgements about compositional unity involved an holistic generalisation of the key concepts, rather than an isolated analysis of their relations. The inter-related nature of the visual elements, spatial organisation and techniques allowed a random fusion of visual information. The ability to make holistic interpretations was examined through the ability to relate appearance to the following functions.

- a) Utilitarian functions as an imitation of life or the communication of ideas;
- b) Expressive functions as the communication of emotions;

c) Formalist functions as the organisation of pleasing/interesting forms for formal unity or the solution to a design problem.

It was assumed that functional generalisations of meaning were related to different analytic perceptions, as shown in Figure 7. Further holistic abilities involved: identifying a theme and a title, as well as giving more than one interpretation for an artwork, and relating different interpretive functions to differences in the appearance of artworks. The critical abilities for holistic interpretation are shown in Figure 8.

FIGURE 8.

THE CRITICAL ABILITIES FOR HOLISTIC INTERPRETATIONS.

- 1 the ability to relate appearance to the following interpretative functions:
 - 1a. UTILITARIAN FUNCTIONS.
 - i. the ability to infer a meaning from an imitation of life;
 - ii. the ability to infer the ideas, issues, beliefs and values communicated;
 - 1b. EXPRESSIVE FUNCTIONS.
 - i. the ability to infer the emotions communicated.
 - 1c. FORMALIST FUNCTIONS.
 - i. the ability to infer meaning as the organisation of pleasing forms;
 - ii. the ability to infer meaning as a united formalist composition;
 - iii. the ability to infer meaning as the solution to a design problem.
 - 2. the ability to identify differences between artworks;
 - 3. the ability to infer a theme;
 - 4. the ability to infer a title;
 - 5. the ability to offer an alternative interpretation.
-

4.2.1.5. The Contextual Interpretive Abilities.

The development of the contextual interpretive abilities were also derived from projecting key concepts through a related conceptual sequence of description; analysis interpretation. However, the key concepts differed because contextual abilities focused on sociological and historical analyses of information for interpretations of thematic unity as the communication/reflection of social

messages. Interpretations of the social significance of artworks required a knowledge of the influence of the historical circumstances and social groups on the conditions of production

The four key concepts selected for projecting the contextual interpretative abilities were as follows.

1. The artist's intention, which involved relating the construction of meaning to the artist's motives, influences and planning with evidence from the artist's life, work or writing.
2. Stylistic analysis, which involved relating the artist's vocabulary of forms to an historical context, through evidence of a chronological correspondence with stylistic developments in art practice.
3. Art history, which involved the provision of documentary evidence of the historical and social factors that influenced art production i.e. the artist's life and works, art practice and life at the time of production.
4. Art criticism, in which interpretations and evaluations could be supported with evidence from contemporary criticism, which indicated how the artwork was critically received at the time.

The critical abilities required for these contextual methodologies are shown in Figure 9. However, in order to avoid replication, knowledge of the artist's life was placed in the art history section. There were three additional interpretative abilities: to infer the theme as a reflection of life; to infer the social message communicated; to relate interpretations to contemporary social events or theories

that required adding as a contextual subset to the visual Utilitarian interpretations of meaning. The evaluations of social/historical significance were considered with the following visual interpretations of meaning, as both used 'appropriateness' methodologies.

4.2.1.6. The Critical Abilities for Evaluation

The evaluative abilities were derived from functional evaluations, which ranked merit or value according to the appropriateness of the structural organisation for the purpose. The ability to make a functional evaluation was related to the ability to choose a functional category, to evaluate whether the information from the content analysis supported the interpretation. However, there were visual and contextual methods for evaluating interpretations of meaning.

4.2.1.6.1. The Visual Evaluative Abilities.

The abilities to make a functional evaluation of thematic and formalist unity, were related to the ability to select a functional category (Pepper, 1965; Reid, 1969) and one of two methods of evaluation.

1. Evaluating the appropriateness of the means of communicating:

- a) truth to life (Utilitarian evaluation of literal thematic interpretations)
- b) significant ideas (Utilitarian evaluation of psychological thematic interpretations);
- c) significant feelings (Expressive evaluation of psychological thematic interpretations);
- d) significant form (Formalist evaluation of technical interpretations of unity)
- e) the solution to a design problem (Formalist evaluation)

FIGURE 9.

THE CONCEPTUAL DEVELOPMENT OF THE CONTEXTUAL
INTERPRETIVE ABILITIES.

A) THE INTENTIONAL ABILITIES

ANALYSIS	INTERPRETATION	EVALUATION
1. to relate the artist's planning and making to the production of an artwork.	4.to identify an intended meaning (from the artist's life).	(social significance)
2. to infer the reasons for the artist's intention.	5. to compare one's own point of view with the artist's intention.	
3. to identify difficulties in comprehending the visual evidence		

.....

2. THE STYLISTIC ANALYSIS ABILITIES

ANALYSIS	INTERPRETATION	EVALUATION
1.to infer the name of the artist from the visual evidence	subsumed with interpretations of the artist's life and art practice.	(stylistic and historical significance)
2. to infer the date;		
3. to infer the historical context;		
4. to infer the country of origin;		
5. to differentiate between past and present styles and conventions;		
6. to classify according to genre;		
7. to classify according to stylistic movements.		

.....

3) ART HISTORICAL ABILITIES.

ANALYSIS	INTERPRETATION	EVALUATION
1. to recognise that art-works are historically determined and change over time.	3. to infer the artistic developments and interests at the time of production;	(social and historical significance)
2. to recall knowledge about an artists life.	4. to use knowledge of an artist's life to understand the artwork;	
	5. to infer from the artwork about life at the time of production,	6. to historically validate inferences about life at the time of production.

.....

4. ART CRITICISM ABILITIES.

ANALYSIS	INTERPRETATION	EVALUATION
	1. to compare one's own interpretation with contemporary critical evidence.	(for a contextual evaluation of meaning).

2. Evaluating the technical merit according to:

- a) the clarity of the imitation (Utilitarian evaluation of literal thematic interpretations);
- b) the emotive intensity of the depiction (Expressive evaluation of thematic interpretations);
- c) the appropriateness of use of materials (Formalist evaluation of techniques).

A stylistic evaluation of artistic achievement as originality (Hickey, 1975), according to the artist's departure from established codes and conventions was included with the visual evaluations. The visual evaluative abilities are shown in Figure. 10.

4.2.1.6.2. The Contextual Evaluative Abilities.

Contextual evaluations of the cultural significance of the visual message were derived from social-historical methodologies. The thematic significance of the artist's mediation of social-historical-cultural messages was evaluated by:

- a) a correspondence with religious, political, moral, social theories for determining social significance;
- b) how accurately the artwork reflected the historical circumstances and ideas of the time for determining the historical significance.

Stylistic evaluations were limited to judgements of originality. Ideological and economic evaluations were omitted from the projections in order to limit the scope of the enquiry. The contextual evaluative abilities are shown in Figure 10.

4.2.1.7. The Reflective Abilities.

The reflective abilities were derived from Feldman's (1971) description of hypothetical criticism, which co-ordinated and , to some extent, repeated the methodology for visual and contextual functional evaluations. Feldman regarded an hypothesis in art as a plausible explanation of an artworks meaning i.e. an interpretation based on an organisational principle (idea/feeling/problem) and could include contextual explanations. Interpretations were evaluated according to whether the explanations 'fitted' the informational support derived from a description and analysis of an artwork. Informational support from visual and contextual sources could be used for deductive and informal reasoning, as well as preference judgements based on likes and dislikes. If necessary, the hypothesis could be revised so that it was consistent with the findings. Hypothetical enquiry would involve a comparative analysis of two or more interpretations to determine the best fit interpretation. The reflective abilities, derived from Feldman's hypothetical criticism, are shown in Figure 11.

The operational level of critical abilities on the matrix were projected from the definition of operational levels of development required for the modal measure. Therefore, a description of the elaboration of the modal measure needed to precede the description of the matrix projections and the operational criteria for assessing art critical abilities.

FIGURE 10.

THE VISUAL AND CONTEXTUAL EVALUATIVE ABILITIES.

A) THE VISUAL EVALUATIVE ABILITIES.

- 1. to identify a purpose or function from the visual organisation:
- 2. to select a functional category for evaluating artworks:
 - 2a. Utilitarian:
 - i. to evaluate truth to life.
 - ii.to evaluate the means of communicating ideas beliefs and values.
 - 2b. Expressive:
 - i. to evaluate the means of communicating emotions.
 - ii, to evaluate the intensity of emotional depiction's.
 - 2c. Formalist.
 - i. to evaluate pleasing qualities;
 - ii. to evaluate a formal unity;
 - iii. to evaluate the solution to a design problem.
 - 2d. Technical Merit
 - i. to evaluate the use of materials
 - ii. to evaluate the skill of depiction.
 - 2e. Originality
 - i. to evaluate originality as the departure from established codes and conventions.

2. THE CONTEXTUAL EVALUATIVE ABILITIES.

- 1. to use contemporary theories to evaluate social significance
 - 2. to evaluate the historical significance through the accuracy of the historical documentation
-

FIGURE 11

THE REFLECTIVE ABILITIES.

- 1. to use a critical strategy.
 - 2. to revise interpretations in the light of the visual evidence;
 - 3. to comparatively evaluate the merits of several artworks;
 - 4. to give a 'goodness of fit' evaluation;
 - 5. to give visual explanatory support for meaning;
 - 6.. to give contextual explanatory support for meaning.
 - 7. to be critical of others interpretations
 - 8. to give reasons for preference judgements.
-

4.3. The Elaboration of the Modal Measure.

The initial modal measure (Stuart, 1989) was derived from Peel's (1971) methodology, which used modes of reasoning to identify the following operational levels of response from explanations.

1. Early concrete levels: restricted references;
2. Late concrete levels: references to circumstantial causes;
3. Formal levels: imaginative references to external causes involving the use of generalised theoretical reasoning.

Concrete and formal operations were differentiated by 'describer' and 'explainer' thinking (Peel, 1971 p.26). The reliability of Peel's measuring instrument was confirmed by Rhys (1964), through a high correlation with an M.A. Raven's Matrices test. However, the British Ability Scales (Elliot, 1983) failed to confirm the external validity of social reasoning tests which employed Peel's methodology.

The elaboration of the modal measure involved identifying general modes of reasoning that could be translated into art critical terms for assessing art critical abilities. A general modal measure was derived from combining Piaget's, (1968) Peel's (1971) and Hickey's (1975) operational criteria for assessing early-late concrete and formal operational levels of development. It was assumed that the methodologies would be compatible. This was because their measures were based on a progressive maturational scale that ranked levels of thinking according to the underlying cognitive functions employed in critical response. The following operational categories were identified for defining operational levels of response:

1. Tautological for early concrete levels derived from Piaget's description of early concrete reasoning;
2. Circumstantial for late concrete levels derived from Peel's description of late concrete reasoning;
3. Theoretical reasoning for formal levels derived from Popper's (1972) description of formal thinking based on the use of rules and principles.

Popper's theoretical category replaced Peel's imaginative category as it was found that imaginative references to external causes could be based on circumstantial reasoning. Theoretical thinking included abstract generalisations, as in linguistic enquiry it was difficult to differentiate between abstract generalisations and generalised theoretical reasoning. The theoretical category also included a comparison of theoretical interpretations (Lunzer, 1968) and metacognitive reflection through the use of rules to evaluate or monitor thinking (Sternberg, 1987). Concrete and formal operations were differentiated by descriptor and theoretical thinking, as it was found that explanations were used at concrete levels of development.

The following criteria, based on the development of classification and causal relations for hypothetical enquiry, were used to identify operational levels of explanations (Piaget, 1968).

Pre- operational 'reasoning' was based on subjective observation of unretentive actions and characterised by:

- a) a non-analytic undifferentiated global fusion of thought;
- b) pluralistic classification e.g. horse as a class of animal (Hickey, 1975, p. 59.).
- c) an arbitrary ordering of relations.

Syncretic explanations were indicated by a narrative description based on observed similarities and confused relations. Explanations were justified through an implicit self validating agreement, based on the assumption that everything was connected to everything else.

1. Tautological reasoning was based on subjective observations of actions that were retained and translated into language. Tautological reasoning was characterised by:

- a) literal concepts based on partial observations of similarities, some differences for items and conservation of physical properties i.e. size, length, area;
- b) classification by resemblance i.e. common features and attributes;
- c) spatial relations ordered in a narrative sequence of time for a few static/isolated items;
- d) physical cause and motive could be established but cause and effect relations would be confused.

Tautological explanations were indicated by a content dominated narrative description of the subject matter and physical properties for: causes, motives, events, happenings and stories. There would be difficulties describing emotions; relating parts to a whole composition, technical and historical sequences.

Explanations would be justified through an implicit correspondence with physical reality i.e. resemblance or assertions e.g. I know.

2. Circumstantial reasoning was based on the linguistic internalisation of observed actions, although decentering allowed:

- a) analysis of two observed elements for some differentiation of causal and generalised relations;
- b) projected relations from another point of view for spatial, symbolic, analogous, emotive and intentional relations.

Circumstantial reasoning was characterised by:

- a) concepts based on a functional analysis of observed relations and processes, rather than the subject matter;
- b) classification based on observed similarities or differences for items and relations with generalisations of common features;
- c) parts related to the whole composition;
- d) relations ordered in a narrative, historical or causal sequence with an inversion of the working order and generalised conclusion for hypotheses, processes or problem solving.

Circumstantial explanations were indicated by content dominated or external circumstantial information. Explanations would be related to the artist's intention; problem solving; technical and historical sequences. Functions (thematic, formal, contextual) would be explained in literal: symbolic; analogous; emotive; spatial and technical terms. Explanations could be justified either by correspondence with physical reality or simple abstract concepts e.g. time, psychological states.

3. Theoretical reasoning was based on hypothetical assumptions, comparative analysis of several elements or viewpoints, and logical proof i.e. a synthesis and reversal of causal relations for error free conclusions.

Theoretical reasoning was characterised by:

- a) theoretical concepts based on abstract generalisations for: definitions, themes, theories, rules, principles, issues, ideas, feelings, beliefs, values, systems, processes, solutions, historical development and contexts.
- b) relative comparisons;
- c) theoretical reversals;
- d) the identification of error, ambiguity or humour.

Theoretical explanations would be indicated by complex combinations of several relations for a whole sequence of reasoning, abstract generalisations, assumptions and relative comparisons. Explanations would be justified by theoretical means i.e. according to a correspondence with theories, rules and principles or logical proof.

There now follows a description of the matrix of art critical abilities and the projection of operational levels for each ability. The criteria for projecting operational levels are repeated in greater detail in the description of the modal measuring instrument in the following chapter (Chapter 5).

4.4. The Matrix Projections.

The operational level of each art critical ability was projected by identifying the underlying modes of reasoning i.e. early concrete operations indicated by tautological modes; late concrete operations indicated by circumstantial modes; formal operations indicated by theoretical modes.

Projections were based on the assumption that operational changes in modes of thinking would be reflected in the use of language as differences in comprehension. The matrix projections to determine the operational level of art critical abilities used the following indicators: 'Y' indicated that abilities were possible at that level; 'N' indicated that abilities were not possible at that level; 'L' indicated a limited understanding.

The operational projections for the matrix followed Hickey's (1975) methodology, which made separate projections for the descriptive, analytic, interpretative and evaluative abilities, to compare phases and operational stages. This provided a means of co-ordinating the projection and assessment of the multi-functional visual abilities, but prevented the development of a related concepts or specific functional methods of assessment. However, the contextual abilities were retained in sets of key concepts and their projections are described after the visual abilities. The projections for the reflective abilities are made at the end of the section. In addition there could be slight variations in the definitions of the abilities for conceptual development and the matrix, which were made for assessment purposes.

4.4.1. The Projections for the Descriptive Abilities.

The descriptive abilities were projected for the cognitive process of classification through the naming of items (visual elements) tools and materials (treatment) from the surface marks and their relations, by identifying the position of the visual elements (structure). It was assumed that classification by naming was based on

associations with physical reality and would be present at all levels of development. However, tautological responses would be less complex than circumstantial responses, and theoretical modes would be mainly in concrete terms apart from abstract generalisations. Therefore, the ability to make generalised definitions was projected on the matrix. It was assumed that they would not be possible for tautological modes and be in literal terms for circumstantial modes and abstract terms for theoretical modes. The projections for the descriptive abilities are shown in Figure 12.

4.4.2. The Projections for the Analytic Abilities.

The analytic abilities were projected for an analyses of relations through an analysis of the artist's methods of organising the visual elements, structure and treatment. However, there were a variety of analyses which developed at different levels. Literal analyses would be possible at tautological levels of development for:

- a) decoding static items as signs and for another person's thoughts; decoding the physical qualities of formal elements;
- b) decoding 'real' space and topological relations, but not the method of projecting space;
- c) decoding a technique, decoration, pleasing form and a realistic treatment.

Symbolic, emotive and analogous analyses would be possible at circumstantial levels of development for:

- a) a literal and symbolic decoding of the subject matter (items, scenes, thoughts, feelings, moods, atmospheres) and the physical, abstract or emotive qualities of formal elements;
- b) decoding schematic links and emotive spatial relations, but spatial projections would be limited to description;
- c) the decoding of techniques for different treatments.

A comparative analysis would be possible at theoretical levels of development for all analyses and abstract generalisations which would allow the identification of methods of projecting space. The matrix projections for the analytic abilities are shown in Figure 13.

4.4.3. The Projections for the Interpretive Abilities.

The interpretive abilities were projected for a synthesis of relations through an interpretive generalisation of a unifying principle of organisation i.e.

- a) thematic unity for Utilitarian, Contextual, Expressive communications, and analogously for Formalist functions;
- b) formal unity as balance, harmony (pleasing qualities) variety, interest, or the solution to a design problem.

Literal associations for tautological levels of development would allow the decoding of a narrative story, the life imitated and pleasing forms, with limited spatial and technical associations for solutions to design problems.

Literal, symbolic analogous and emotive generalisations in a narrative sequence of time at the circumstantial level of development would allow the identification of a

title, a variety of themes, solutions to design problems and contemporary events.

Decentering would allow the identification of alternative interpretations.

Abstract generalisations and use of rules and principles at theoretical levels of development would allow all thematic and formal generalisations for compositional unity and references to contemporary theories. Separate projections are given for the visual and holistic interpretative abilities in Figures 14, 15 but they were projected from the same criteria.

4.4.4. The Projections for the Evaluative Abilities.

The evaluative abilities were projected for an evaluation of relations through a comparative ranking of the merits of artworks according to their function i.e. Utilitarian, Expressive, Formalist, Contextual. Literal associations with physical reality or techniques at the tautological level of development would allow a limited evaluation of the truth to life, pleasing qualities, formal unity, originality and technical merit as accuracy.

A ranking of different points of view and techniques in time at the circumstantial level would allow an evaluation of:

- a) thematic unity in social, historical and cultural contexts, through the appropriateness of the communication;
- b) formal unity as the solution to a design and technical merit through the appropriateness of the technical process
- c) originality as the departure from traditional codes and conventions.

However, evaluations of significance would be limited.

Ranking of theories, rules and principles at the theoretical level of development would allow a theoretical evaluation of the appropriateness of all of the functions. The matrix projections for the evaluative abilities are shown in Figure 16.

4.4.5. The Projections for the Contextual Abilities.

The contextual abilities were projected for the cognitive process of analysis, interpretation, and evaluations. The projections for the contextual abilities were separated into intentional and historical abilities (stylistic analysis, art history and contemporary criticism).

4.4.5.1. The Intentional Abilities.

The following projections were made for the intentional abilities, which required a psychological association with motives. Literal associations with techniques at the tautological level would allow a limited analysis of the artist's technical process but not explicit associations with intentions.

Decentering for comparisons of intentions at the circumstantial level would allow an intentional analysis of all abilities apart from the identification of comprehension difficulties.

Meta-cognitive reflection and intentional abstract generalisations at the theoretical level would allow responses for all of the intentional abilities. The projections for the intentional abilities are shown in Figure 17.

4.4.5.2. The Historical Abilities.

The following projections were made for the historical abilities which required an association with time.

Literal associations with physical reality at the tautological level would allow a limited decoding of the artist, country of origin, past and present styles and the life reflected from the subject matter. Poor time concepts would prevent historical analyses, although subjects could criticise simple art concepts in any context.

Comparisons of relations in time at the circumstantial level would allow analyses of all of the historical abilities apart from historical generalisations of art practice and validations. However, stylistic classification, recalling knowledge about the artist and life at the time of production would be limited.

Historical generalisations at the theoretical level would allow responses to all of the historical abilities. The projections for the historical abilities are shown in Figure 18.

4.4.6. The Projections for the Reflective Abilities.

The reflective abilities co-ordinated the use of a critical strategy to give explanations and evaluations of findings for the visual and contextual abilities.

The reflective abilities were projected on the assumption that reasoning for:

- a) tautological levels would be limited apart from preference judgements and that revisions and evaluations would not be possible;
- b) circumstantial levels would be possible for all but a 'best fit' evaluation, but evaluations of merit or functions would be limited;
- c) theoretical levels would be possible for all of the reflective abilities.

The matrix projections for the reflective abilities were shown in Figure 19.

FIGURE 12

THE OPERATIONAL PROJECTIONS FOR THE DESCRIPTIVE ABILITIES
(THE VISUAL ELEMENTS, STRUCTURE AND TREATMENT).

<u>Descriptive Abilities.</u>	<u>ECO</u>	<u>LCO</u>	<u>FO</u>
<u>THE VISUAL ELEMENTS.</u>			
1. to name items;	Y	Y	Y
2. to name formal qualities;	Y	Y	Y
.....			
<u>STRUCTURE</u>			
3. to name the position of visual elements;	L	Y	Y
.....			
<u>TREATMENT.</u>			
4. to name tools, materials and media;	Y	Y	Y
.....			
5. to use generalised definitions	N	Y	Y
.....			
ECO = Early concrete operations Y = possible			
LCO = Late concrete operations N = not possible			
FO = Formal operations. L = limited.			
.....			

FIGURE 13.

THE OPERATIONAL PROJECTIONS FOR ANALYTIC ABILITIES FOR THE VISUAL
ELEMENTS, TREATMENT, AND STRUCTURE.

Analytic Abilities	ECO	LCO	FO
VISUAL ELEMENTS			
Subject-Matter.			
1. to decode signs in literal terms;	Y	Y	Y
2. to decode symbols from literal sources;	N	Y	Y
3. to infer thoughts from images;	L	Y	Y
4. to infer feelings from images;	N	Y	Y
5. infer a realistic scene;	Y	Y	Y
6. infer a mood or atmosphere;	N	Y	Y
.....			
Formal elements.			
1. to decode physical qualities;	Y	Y	Y
2. to identify the texture;	Y	Y	Y
3. to decode abstract qualities;	N	Y	Y
4. to decode emotive qualities;	N	Y	Y
5. to associate colour with emotions;	N	Y	Y
STRUCTURE			
1. to identify realistic projections;	L	Y	Y
2. to identify schematic links as:	Y	Y	Y
a) arrangements;	Y	Y	Y
b) focal points;	N	Y	Y
c) a colour scheme;	N	Y	Y
d) movement;	L	Y	Y
3. to associate emotions with spatial relations;	N	Y	Y
TREATMENT: TECHNIQUES			
1. to describe the use of formal elements;	L	Y	Y
2. to identify the techniques/processes;	L	Y	Y
TREATMENT: MANNER OF WORKING			
3. to identify a realistic treatment;	Y	Y	Y
4. to identify an emotive treatment;	N	Y	Y
5. to identify an abstract treatment;	N	Y	Y
6. to identify a decorative treatment;	Y	Y	Y
7. to identify differences between artworks;	L	Y	Y
8. to differentiate between recorded and imagined modes of depiction.	L	Y	Y
.....			

FIGURE 14

THE OPERATIONAL PROJECTIONS FOR INTERPRETATIONS FROM THE VISUAL
ELEMENTS, STRUCTURE AND TREATMENT.

<u>Interpretive Abilities</u>	<u>ECO</u>	<u>LCO</u>	<u>FO</u>
VISUAL ELEMENTS			
1. to infer a literal theme from the physical qualities, and subject matter;	story	theme	issue
2. to infer ideas, beliefs and values from the subject matter;	N	Y	Y
3. to infer the emotions communicated by the subject matter;	N	Y	Y
4. to infer the pleasing qualities produced by the formal elements;	Y	Y	Y
5. to infer analogous themes from the formal elements;	N	Y	Y
STRUCTURE			
1. to associate realistic space with a narrative interpretation of a story or theme.	Y	Y	Y
2. to associate schematic links with compositional unity;	N	N	Y
3. to associate schematic organisation with the solution to a design problem;	L	Y	Y
4. to associate spatial relations with emotions;	N	Y	Y
TREATMENT			
1. to infer an imitation of life from a realistic treatment	Y	Y	Y
2. to infer the emotions embodied in an emotive treatment.	N	Y	Y
3. to infer the solution of a design problem from abstract treatment.	N	Y	Y
4. to associate decorative treatment with the production of pleasing technical qualities.	Y	Y	Y

.....

FIGURE 15.

THE PROJECTIONS FOR HOLISTIC INTERPRETATIONS FOR UTILITARIAN;
CONTEXTUAL; EXPRESSIVE AND FORMALIST FUNCTIONS.

<u>Interpretive Abilities.</u>	<u>ECO</u>	<u>LCO</u>	<u>F</u>
1a. UTILITARIAN			
i. to infer a meaning as an imitation of life;	Y	Y	Y
ii. to infer the ideas, beliefs, values communicated;	N	Y	Y
1b. CONTEXTUAL			
i. to infer a visual message about society;	L	Y	Y
ii. to relate the theme to contemporary events; theories;	Y	Y	Y
	N	N	Y
1c. EXPRESSIVE			
i. to infer the emotions communicated;	N	Y	Y
1d. FORMAL			
i. to infer the production of pleasing forms,	Y	Y	Y
ii. to infer a united composition ;	L	Y	Y
iii. to infer the solution to a design problem;	N	Y	Y
2. to infer a theme;	N	Y	Y
3. to infer a title;	N	Y	Y
4. to offer an alternative explanation of meaning;	N	Y	Y
5. to select and make a functional interpretation.	L	Y	Y

FIGURE 16.

OPERATIONAL PROJECTIONS FOR THE EVALUATIVE ABILITIES

<u>Evaluative Abilities.</u>	<u>ECO</u>	<u>LCO</u>	<u>.FO.</u>
1. to identify a purpose or function from the visual contents.	L	Y	Y
2. to make a functional evaluation:			
2a. Utilitarian:			
i. to evaluate the truth to life of stories, themes issues;	L	Y	Y
ii. to evaluate the means of communicating ideas, beliefs, values.	N	Y	Y
2b. Contextual:			
i) to evaluate the social significance of a message;	N	L	Y
ii. to evaluate historical significance;	N	L	Y
iii. to evaluate cultural significance;	N	L	Y
2c. Expressive:			
i. to evaluate an emotive communication;	N	Y	Y
2d. Formalist.			
i. to evaluate pleasing qualities;	L	Y	Y
iii. to evaluate a composition;	L	Y	Y
iv. to evaluate the solution to a design problem;	N	Y	Y
2e. Technical Merit			
i) to evaluate the use of materials;	N	Y	Y
ii. to evaluate the technical skill;	L	Y	Y
2f. Originality			
i) to evaluate originality, as the departure from established codes and conventions.	L	Y	Y

FIGURE 17.

OPERATIONAL PROJECTIONS FOR THE INTENTIONAL ABILITIES.

<u>Contextual Critical Abilities.</u>	<u>ECO</u>	<u>LCO</u>	<u>FO</u>
A) ARTIST'S INTENTION			
1. to relate the artist's planning and design processes to the production of an artwork;	L	Y	Y
2. to infer reasons for the artist's intention;	N	Y	Y
3. to identify an intended theme.	N	Y	Y
4. to compare own point of view, with the artist's intention;	N	Y	Y
5. to identify difficulties in comprehending visual evidence.	N	N	Y

FIGURE 18.

THE OPERATIONAL PROJECTIONS FOR THE HISTORICAL ABILITIES (STYLISTIC ANALYSIS, ART HISTORY, CONTEMPORARY CRITICISM).

B) STYLISTIC ANALYSIS

Contextual Critical Abilities.

	ECO	LCO	FO
1. to infer the name of the artist;	L	L	Y
2. to infer the date;	N	Y	Y

3. to infer the country of origin;	L	Y	Y
4. to differentiate between past and present styles and conventions;	L	Y	Y
5. to classify according to genre;	N	Y	Y
6. to classify according to styles;	N	L	Y

C) ART HISTORY

1. to recognise that artworks are historically determined and change over time;	N	Y	Y
2. to infer from the artwork the artistic developments and interests at the time of production;	N	N	Y
3. to recall knowledge about an artist's life;	N	L	Y
4. to use knowledge of artist's life to understand the meaning;	N	Y	Y
5. to infer from the artwork about life at the time of production (historical context);	L	L	Y
6. to historically validate inferences about life at the time of production.	N	N	Y

D) CONTEMPORARY CRITICISM.

1. to evaluate contemporary criticism.	L	Y	Y
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.....

FIGURE 19

OPERATIONAL PROJECTIONS FOR THE REFLECTIVE ABILITIES.

Reflective Abilities.

	ECO	LCO	FO
1. to use a critical strategy;	L	Y	Y
2. to revise interpretations in the light of the visual evidence;	N	Y	Y
3. to comparatively evaluate the merits of several artworks;	L	L	Y
4. to give a 'best fit' evaluation;	N	N	Y
5. to give explanatory support for:			
a. visual elements	L	Y	Y
b. structure	L	Y	Y
c. Treatment	L	Y	Y
d. functional interpretations	L	Y	Y
e. functional evaluations	N	L	Y
6. to give explanatory support for contextual abilities;	L	Y	Y
7. to give reasons for preference judgements.	Y	Y	Y

.....

4.5. Summary.

The descriptive research design was described for projecting and testing a matrix of art critical development. The strategy for testing the projected matrix of art critical development and the objectivity of the modal measure was also described. The matrix of art critical development was projected by determining the operational level of descriptive, analytic, interpretive, evaluative, contextual and reflective art critical abilities from the underlying modes of reasoning. However, a pre-requisite for the projections was the projection of conceptual development in art through a critical strategy of description, analysis, interpretation and evaluation to identify the art critical abilities and the elaboration of a modal measure to provide criteria for the operational projections.

CHAPTER 5.

THE RESEARCH METHODOLOGY.

The description of the research methodology is separated into the research procedures and the measuring instruments.

5.1. The Research Procedures.

The research procedures are described for the sample selection, the location, conditions, the pilot test and the implementation of the tests.

5.1.1. The Sample.

The aim of the study was to extend the operational assessment of the modal measure to include an assessment of three operational levels to include children aged six to eighteen years of age. Therefore, a wide age range sample was required to provide evidence of changes in mental operations during the transition from:

- i) pre-operational to early concrete operations, aged 6-7;
- ii) late concrete to formal operations aged 9-14 years.

The wide age range samples were given three operational tests to determine three operational samples for E.C.O., L.C.O, F.O. to test an operational relation with art critical development and the modal measure. It was assumed that the following sample groups consisting of thirty-one subjects from three phases of schooling would provide data for testing three operational levels of development.

1. a primary school sample of twelve key stage 2 children aged 6-7 years,
2. a middle school sample of twelve key stage 3 children aged 12-13 years,

3. a sixth form sample of seven 'A' level students, aged 16-17.

The three age related samples of school populations, were selected by random from a one year intake of: 90 primary; 100 middle school and 200 lower sixth subjects. Each random sample was intended to contain twelve subjects, with an equal number of males and females who had undertaken a course of study in art and design. However, the sixth form sample was restricted to seven because of the limited number of art (7) and design-technology (8) subjects in the lower sixth population. The sixth-form sample consisted of: three females and a male from art, and three males from design technology which included an art technology option. Two additional female art students were omitted from the tests because of a family holiday and illness. The random samples were selected by teacher judgement and based on voluntary participation. All of the samples were selected by the teacher with responsibility for art and design.

Personal information was restricted to age, date of birth, sex and name and checked with the school register. In order to maintain confidentiality addresses were omitted, and names were identified by a letter and a number. The letter represented the sample population: Primary, Middle, Upper school. The number indicated the random interview order. This information along with the 'A' level art-design-technology options is shown in Appendix II. Further personal information about socio-economic status, cultural background and intellectual ability was omitted because this was not available from the schools' records. Also, a large representative sample of national test key stage results was not available

which might have provided confirmation of the objectivity of the modal test scores.

5.1.2. The Location.

The location for testing the samples from three school populations was in a small industrial town in Leicestershire. The three schools were selected from a family or cluster of schools related by transfer from nine primary to four middle schools to one upper school. The three selected schools shared the same catchment area from the town and surrounding villages. The catchment area included established, new and council houses. The socio-economic status of the pupils was middle class, and weighted towards lower middle class. The three schools were selected to represent three phases of schooling, as organised by the Leicestershire plan, which was a three tier comprehensive system. These were:

1. A county junior school, with key stage 2 pupils aged 7-11 years;
2. A middle school with key stage 3 pupils aged 11-14;
3. An upper school with GCSE and 'A' level students aged 14 -18 years.

The continuity of the subject's learning experiences was co-ordinated through national programmes of study or examination syllabi and assessment based on developmental progression. However the learning experiences in each school differed according to the organisation of the school curriculum.

5.1.2.1. The Primary School.

The county junior school opened in 1961. The school was organised on an open plan system, with three classes of mixed ability groups in each year. Classes were set for core subjects, and foundation subjects were mainly taught by a form tutor.

The curriculum followed the National curriculum for key stage 2. The core subjects of Mathematics, English and Science were emphasised. The curriculum was project based, for individual or integrated subjects. Art and design key stage 2. was mainly based on integrated projects and undertaken in the classroom (B.C.P.S. Prospectus, 1993). There was a strong focus on the role of art in integrated projects as reported by Bolan (1993). The year three sample had all completed an observational drawing of a shoe; an imaginative drawing of a breakfast; a collage bird mobile, and descriptive critical skills from analysis of an illustration.

5.1.2.2. The Middle School.

The middle school was a church school (Dominican) and opened in 1963. The school had separate subject areas with purpose built rooms, and pupils were taught by specialist teachers. Core subjects were taught in sets, and foundation subjects in general ability groups. The curriculum at key stage 3, included the same core and foundation subjects and religious education as for primary schools, with the addition of a foreign language (S.M.C.S. Prospectus, 1993).

Art was taught as a separate component in an art design module i.e. art, food, textiles and design technology which included information technology. The art curriculum for key stage 3 consisted of a foundation course of drawing; painting; graphic design and formal elements followed by two further years of two and three dimensional projects, as well as a written and illustrated study of the work of one artist. The year eight sample had completed some of the following: a still life

drawing; a perspective view through a window in mixed media; a computerised design; designing and making a mask and a written project.

5.1.2.3. The Upper School.

The upper school was founded as a grammar school and became a comprehensive school in 1957. The school was organised into specific subject areas. Pupils were taught by specialist staff in either mixed ability or set groups for two year GCSE and 'A' level courses. The curriculum for GCSE was based on the core subjects and student selection of options for foundation subjects. The curriculum for 'A' level was based on student selection of three 'A' level subjects. All GCSE and 'A' level curricular were defined by examination syllabi (J.C.C. Prospectus, 1994-5).

Art, design and technology were taught in a purpose built open plan block, to mixed ability groups. The art curriculum for lower sixth students was determined by the Northern Examination Associated Board 'A' level exam, which emphasised depth rather than diversity. Students undertook individual two and three dimensional projects, and a written illustrated essay about the work of a twentieth century artist, for a short speech. Students also attended a series of art and design lectures. The lower sixth sample had completed: a still life drawing in mixed media of a violin; a 2D/3D montage of a landscape or building from any culture or historical period; a fantasy landscape painting; an imaginative composition of animals/fruit/people in any style and a written project. One of the technology students had also completed an essay on Manet, Degas and the Bauhaus for general studies.

All of the schools were contacted by letter, to ask the head teachers' permission to conduct the research in their schools. Information about the research project, was also included in the letter (Appendix III). The supervisor then visited the school to meet the head teacher and provide further information and receive feedback from the teacher's participating in the project. After completion of the testing, the head teachers and teachers were sent separate letters to thank them for participating in the project (Appendix III).

5.1.3. The Test Conditions.

The tests were undertaken sequentially in each school, from February to July in 1993. The tests were of twelve days duration in the primary and middle schools (24th Feb.-4th March; May 12th-26th) and nine days duration in the upper school (July 4th-14th). In general the tests were administered in two parts and on separate occasions. The three Piagetian tests (Elliot, 1983) and the test for art critical abilities were in the form of an interview and preceded the vocabulary test (Allison, 1974). If possible all of the tests were held in the morning. However, all of the middle school tests were held at lunch time (Appendix IV). The times of the tests were selected to minimise disruption to pupils' lessons. There was greater flexibility in the primary school, because of teacher control over lesson times, and the upper school, because of pupil's free-study sessions.

The duration of each test for each sample is shown in Figure 20. Consistency in timing for the Piagetian tests was attributed to the standardisation of test

instructions and use of closed questions. Some variation in the duration of questionnaire was related to the limited comprehension of the primary subjects, which limited the number of questions answered. Similarly, the greater length of time required the vocabulary test for the primary school was due to the need to read the whole test for several of the primary subjects.

FIGURE 20

THE DURATION OF THE TEST FOR THE THREE SAMPLES.

Tests	Primary Sample	Middle School Sample	Upper School Sample
Conservation	5 mins.	5 mins.	-
Rotation	3 mins.	3 mins.	-
Verbal Reasoning	-	5 mins.	5 mins.
Critical Abilities	20-30 mins.	35-40 mins.	40 mins.
Art Vocabulary	35 mins	25 mins.	25 mins.
.....			

In general all of the tests were administered in a large, quiet and well lit room.

Each room required:

1. a large table for the Piagetian test materials, the colour prints accompanying the questionnaire and a tape recorder;
2. seating for the participant and supervisor;
3. tables and chairs for a group testing of the Allison Art Vocabulary Test
4. a power point for recording subjects responses.

There were however, physical differences in test conditions. All of the primary tests were administered in the library, with 'child sized' tables and chairs. The middle school Piagetian tests and the questionnaire were administered in a small

open plan office, adjacent to the Home Economics room where the A.A.V.T. was administered. All of the sixth form tests were administered in the sixth form art workshop, which was adjacent to open plan art areas. No lessons were taught in either of the adjacent areas during the tests. However, a tutor in the middle school, and a bell in the upper school interrupted a questionnaire.

5.1.4. The Pilot Test.

Prior to the implementation of the test procedures a pilot test was undertaken in the selected primary school. The pilot test was used to review the procedures for two Piagetian tests, the questionnaire and the vocabulary test. A male and female subject aged seven were selected with limited and above average ability to provide a wide range of responses. The combined Piagetian tests (conservation and rotation only) with the questionnaire in the form of an interview, were administered first, on the same morning (Feb. 8th), to each subject. The A.A.V.T. was administered a month later (March 7th) to both subjects, prior to giving the A.A.V.T. to the primary sample. Subjects were given clarification during the test and asked for feedback during and after the tests.

No alterations were made to the two Piagetian tests. The formal reasoning test was not pre-tested, but lower sixth subjects were asked for feedback. The wording of the questionnaire was modified so that it could be understood by all ages. In the first sub-test some questions were related to a specific context (F1i; F1g; F1b; F3g). In addition the questions on depth (F1d) and colour scheme (F3c) were modified for the primary and middle school samples (Appendix V). The test

instructions for the A.A.V.T. were presented in a clearer sequence (Appendix VIII). All assessment procedures were retained.

5.1.5. The Implementation of the Tests.

The administration of the tests followed the same order for each sample in the form of an interview. The combined Piagetian and Critical Abilities tests were followed at a later date by the Allison Art Vocabulary test. Prior to the tests an interview order and times were agreed with each school. Subjects were informed of the time of the interview and accompanied to the interview room by the supervisor. On route subjects were asked about themselves, their form, art abilities, and briefly told the purpose of the study. All of the interviews were conducted in a calm and friendly manner. All of the test instructions were read to the subjects, to maintain consistency of information. Clarification was pre-defined, where possible. All subjects were given virtually the same introductory instructions for the combined tests; the questionnaire and the vocabulary test, but the Piagetian tests differed for each sample. All of the responses were confirmed with 'okay' to prevent feedback from the supervisor which would alter test performance. After completion of the tests subjects were given an edible reward and the school a large art print. The following test instructions were given.

5.1.5.1. The Instructions for the Combined Tests.

The introductory instructions for the combined Piagetian and Critical Abilities test began with an exchange of names, and an explanation of the purpose and structure of the interview (Appendix V).

5.1.5.2. The Instructions for the Piagetian Tests.

The Piagetian test instructions followed set instructions for each test. However, different tests were used to determine the operational level of each sample (Appendix V) and recorded by the supervisor on a score sheet (Appendix VI). The primary sample was given the instructions for the conservation test of E.C.O. and if necessary the rotation test of L.C.O. The responses to the conservation test were recorded and assessed during the interview. This was in order to determine whether to administer and record responses to the rotation test, which was assessed after the interview.

The middle school sample was given the instructions for the rotation test of L.C.O. and the answers were recorded and assessed during the test. If no answers on the rotation test were correct, then subjects were given the conservation test during the interview. If two or more answers on the rotation test were correct, then subjects were given the formal reasoning test at a later date. This was because of limited testing time. Permission was obtained to tape record responses, which were transcribed onto a score sheet and assessed after the later testing.

The upper school sample was given the instructions for the formal operational test. Permission was obtained to tape record their responses, which were transcribed onto a score sheet and assessed after the interview.

5.1.5.3. The Instructions for the Critical Abilities Test.

All subjects were given the same instructions for the C.A.T., although there were slight adjustments to the wording of a few questions to match the understanding of the samples being tested (Appendix V). Subjects were reassured that the test was informal, enjoyable and anonymous for confidentiality. Subjects were encouraged to express their own opinions and give honest answers, Subjects were asked to keep their answers secret for test reliability. All samples were advised to expect some difficult questions, and to say if they did not understand the question or know the answers. All of the questions were asked, even if they were assumed to be beyond the subjects' capabilities.

The subject's permission was requested for recording their answers. The date and subjects name preceded the recorded answers. At the end of the interview, subjects were asked if there were any questions, and given positive feedback, about their performance. Subjects were also informed of further tests, and thanked for taking part. The subjects answers were tape-recorded, and transcribed afterwards. The subjects words and pauses were transcribed, for each question, and typed in the interview order, alongside an assessment column (Appendix VII). The operational level of the subjects' responses to each question, was determined by the modal measure (Appendix VII).

5.1.5.4. The Instructions for the Art Vocabulary Test.

The Allison Art Vocabulary Test was administered to each sample after the combined tests. Subjects were given a test booklet and read the test instructions

prior to undertaking the test. Subjects responses were recorded on an answer sheet, and assessed after the completion of the test (Appendix IX). However, there were variations in the test procedures. The tests with the primary sample were administered in three different sessions to groups of subjects in the library. The tests were held in the morning with two groups (two females; two males and one female) on the eighth of March, and one group (four males and three females) on March the ninth. The test instructions were read to each group, and the test words if requested. A number of children required individual help with reading, which was possible with small groups. One subject was persuaded in a friendly manner, to stop distracting other participants.

The tests with the middle school sample, apart from one absentee, were administered at lunch time in the Home Economics room on 26th. May. The tests instructions were given consecutively to four groups, to accommodate a staggered lunch time. The composition of the groups is shown in Figure 21. The absentee was tested at lunch time, in the same place at a later date (10th June).

FIGURE 21

MIDDLE SCHOOL SAMPLE GROUPS FOR THE A.A.V.T.

Group 1	Group 2	Group 3	Group 4.
<u>Subject Sex</u>	<u>Subject Sex</u>	<u>Subject Sex</u>	<u>Subject Sex</u>
M.4. M	M.5. F.	M.2. F.	M.8. M
M.6. M	M.10. M.	M.3. F.	
M.7. M	M.12. F.	M.9. F.	
		M.11. F.	

.....

The tests with the upper school sample were administered individually in the morning and at different times and dates (Appendix IV). This was in order to

correspond with 'free-study' time. All Subjects were tested in the same room, and given individual test instructions.

5.2. The Measuring Instruments.

Three measuring instruments we used to compare Piagetian operational levels (Piaget & Inhelder, 1958) with modes of reasoning (Hickey, 1975; Stuart 1989) and vocabulary (Allison, 1974) in art. However, the Piagetian measures and the modes of reasoning measures required revision.

5.2.1. The Standardised Piagetian Measure.

The standardised measure for determining three operational samples for an independent grouping and comparison of operational levels of reasoning and vocabulary was derived from a Piagetian measure of operational levels of development (Piaget & Inhelder, 1958). The measure consisted of the following three sub-tests: conservation of area for E.C.O; a projective relations test for L.C.O. and a formal reasoning test for F.O. However, the Piagetian tests for projective relations and formal reasoning had proved unreliable (Stuart, 1989). Therefore, equivalent standardised operational tests were derived from the British Ability Scales (Elliot, 1983) for all three sub-tests.

The replacement tests were selected from a co-ordinated battery of tests, for children aged six to eighteen years of age. The tests could be used separately or with other scales in the battery. All of the scales were co-ordinated for test comparisons through a uni-dimensional scale that assessed the same degree of

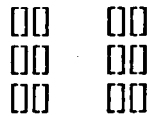
cognitive difficulty employed in reasoning. The content validity of the scale was statistically confirmed through a Rasch 'goodness of fit' model, using 'T' tests. The scale validated the replacement projected relations and formal reasoning tests, but not the conservation of area test.

In addition, operational tests were regarded as an assessment tool, rather than a uni-dimensional measure. This was because operational levels could only be standardised for specific qualities at a particular level of development i.e. a single dimension on a numerical scale. Ordinal criterion referencing of specific qualities within a particular stage, provided consistency for data testing, that was only valid at a specific level. The objectivity of criterion referencing was determined by the coherence of causal connections in explanations or informed judgements, (Elliot, 1883). There now follows a description of the three equivalent operational tests which were selected from the British Ability Scales.

5.2.1.1. The Conservation of Area Test.

The methodology for the conservation of area test for children aged 7-8 years, followed Piagetian procedures. Early concrete operational levels were indicated through evidence of reasoning based on the logic of equivalence, rather than pre-operational judgements based on appearance. The task required the ability to conserve (mentally hold and refer to two things successively), and transform (understand that the same area can be equivalent in different ways at the same time). The replacement test consisted of twelve green cubes, with approximately 3 cm. sides, which represented fields for two test items. The cubes were arranged in

two equal groups of six cubes on a piece of card (43 by 21 cm.) for an introductory example (item i) and then rearranged for the test (item ii). In both cases, subjects were asked to state whether the area of the blocks was equivalent. The two groups of cubes for test item i, were arranged in two by three rectangles as shown below.

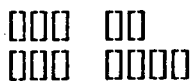


The instructions were: 'We are going to pretend that these are two fields of grass, where three farmer can send his cows to eat. The farmer would put his cows in this field (indicate), or this one (indicate). Subjects were asked:

1. 'Now does this field have more grass? (point to left hand field);
2. Does this field have more grass? (point to right hand field)
3. Do they both have the same amount of grass?'

The questions could be clarified for incorrect responses e.g. by placing one field on top of another, but not by counting the number of cubes.

The two rectangles were re-arranged for test item ii, as shown below.



Subjects were told: 'Here are some other fields', and asked the same set of questions used in item i. (BAS Test Manual p194-5: Elliot, 1983). Subjects were asked to explain their answer to question three (Why?) Subjects could determine

equivalence (that both areas were equal), by counting the same number of cubes in each rectangle. The subjects responses for item ii were rated for:

1. early concrete levels if:

a) responses to questions: 1/2 were 'no'; 3 'yes'; and

b) explanations referred to an equal number of cubes.

2. pre-operational levels, if no explanation of equivalence was given.

5.2.1.2. The Projected Relations Test.

The rotation of letter like forms, provided an alternative test of projected relations, for children aged eight to fourteen years age. Late concrete levels were indicated by a comparison of different visual viewpoints. The task involved matching the opposite view of a standardised figure, with one out of six rotated examples. This required the ability to visualise the rotation of two dimensional figures.

The test consisted of a plastic doll and five cards (22 by 16cm.) for a set of five items. Each of the cards were divided in half by a horizontal line. On the top half above a central standardised figure was a rectangle and directional arrow. This was to place the doll, 'looking' at the standardised figure, and facing the subject. On the lower half of the page were six numbered rotational transformations of the standard figure which included reversals and the correct orientation of the figure. Subjects were asked to match the doll's opposite viewpoint of the given figure with one of the six rotated examples. The matching of viewpoints was indicated by the selection of a matching example. An example of the first item is shown in Appendix VI.

Each of the five test items were shown in a sequence, as indicated by the number of the card. The test items followed the same procedures, although there were more instructions for item i, being an introductory test.

Item i began with the following instructions:

'This is a doll called Fred.

He is going to sit here (place doll in position).

He is looking at this shape (indicate).

Can you show me here (indicate the six examples) what Fred can see from where he is sitting?' (BAS Manual 3, p.3).

The card was placed underneath the pack, when the questions were completed.

The test instructions for items 1 to 4, after the doll was placed in position, were:

'What can Fred see now? Show me here (indicate). If subjects failed items i,1,2,3 clarification was given by :

a) saying 'Now look what Fred can see' and rotating the card 180 degrees;

b) referring to the relevant features in relation to Fred's position e.g. Item i. 'the round end is near Fred, and curves away to Fred's right'.

The card was returned to its original position and the subject asked 'Now show me here (indicate), what you would see if you were sitting where Fred is sitting.'

If subjects failed items 1-4 the instructions were discontinued. Item five was administered, if subjects succeeded on any of the previous items. (BAS Manual 3,

p.3). The subjects responses were rated at the late-concrete level if any matching examples were selected, for any items. The matched examples were as follows:

item 1 = example 6	item 4 = example 2
item 2 = example 5	item 5 = example 1
item 3 = example 5	item 6 = example 4

5.2.1.3. The Formal Reasoning Test.

The Formal Reasoning test provided an equivalent test of formal operational levels of development, for children aged eight to seventeen years of age. However, the test was more suitable for older children in this range. The formal reasoning test was devised by Ward (1972) and used propositional logic to assess differences between concrete and formal operational levels of reasoning. Ward's methodology was derived from Piaget & Inhelder (1958), measure of combinational analysis. This involved sixteen binary propositions, which could be related to logical operations e.g. implications; conjunction; disjunction and equivalence. Ward assessed formal operational levels, through the ability to make a general rule for preference judgements, derived from known and unknown visual information. The task required the ability to make predictions about four different combinations of male and female hair colour, from visual examples that omitted at least one hair colour.

The formal reasoning test consisted of a set of twelve cards, that could be used in different combinations for eleven test items. Each card depicted a boy and girl whose red or yellow hair colour was the critical feature. The hair colours represented four classes e.g. yellow haired boys and girls: red haired boys and

girls. The twelve cards were divided into four sets, which were differentiated by a letter on the back. The four sets showed the four classes of hair colour i.e.

Set A showed a boy and girl with yellow hair;
Set B showed a boy with yellow hair and a girl with red hair;
Set C showed a boy with red hair and a girl with yellow hair.
Set D showed a boy and girl with red hair.

An example from each set of cards is shown in Appendix VI.

There were eleven items to test sixteen binary propositions using different combinations of the sets of card which omitted at least one hair colour. However, the last test item showed all four combinations. The null combination was omitted to avoid confusion. The first two items were introductory and the remaining nine items were rated. The two introductory provided an example of the test procedures. Item i. explained the rules with an example of their application for three cards from set A. ; item ii, provided a further example for subjects to follow the procedures unaided using three cards from set B. Nine further items were given for the following card combinations CCC/DDD/AABB/AACC/AADD/BBCC/ BBDD /CCDD/ABCD. The instruction for the introductory and rated items are shown in Appendix VI.

The nine test items were scored individually using the individual tables for each item as shown in Appendix VI. The tables for scoring each item included: the card combinations; a logical description; and descriptors for three operational levels of development. The assessment procedures for the present study were modified to provide a combined assessment of the nine items. Therefore, evidence

from any of the tests was used to determine the following operational levels of development.

1. Pre-operational levels were indicated by simple descriptions, without references to colour combinations, and irrelevant responses.
2. Concrete levels were indicated by the use of predictions to identify colour preference from;
 - a) colour combinations for two relations, but without references to single cards;
 - b) assumptions that omitted classes followed the same colour combination as on the cards i.e. not aware of alternatives. No general rules were identified.
3. Formal levels were indicated by the use of predictions to identify:
 - a) general rules for colour preferences e.g. same; different; opposite;
 - b) omitted classes as
 - i) either yellow or red hair;
 - ii) unknown, because of lack of evidence i.e. no picture.

5.2.2. The Art Critical Operational Measure.

The art critical operational measure consisted of two sub-tests: the critical abilities test to determine the presence of art critical abilities and the modal measure to determine the operational level of each critical ability projected on the matrix.

5.2.2.1. The Critical Abilities Test.

The critical abilities test was derived from Hickey's (1975) methodology, and consisted of a series of questions to promote responses to determine the presence of art critical abilities projected on the matrix. A series of questions was formulated to match the critical abilities projected on the matrix. The critical

abilities test focused on related concepts for visual and contextual abilities, although visual abilities had been projected for separate descriptive, analytic and interpretive categories on the matrix.

The C.A.T. required the definition of the underlying cognitive functions for each ability and a matching question to determine whether the functions were present. The definitions and questions for each ability were shown in Appendix VII. The notation for the critical abilities was derived from the matrix; the notation for the questions was derived from the critical abilities test. There was no question or testing for the following abilities.

Analysis:

- i. of a symbolic decoding of literal sources;
- ii. to associate spatial relations with emotions;
- iii. to classify by genre;

due to difficulties in devising questions;

Evaluation of:

- i. the means of communicating ideas/values;
- ii. an emotive communication;
- iii. the significance of a social message;
- iv. the solution to a design problem;
- v. to give a best fit evaluation;

as evaluations were limited to art practice.

The critical abilities test consisted of a series of interview questions that were organised into six sub-sets of related concepts. In each sub-set the questions were

asked in conjunction with artworks, which provided the visual data for responses. All of the artworks required the use of visual or contextual information to explain their meaning. A variety of visual examples were selected to match the critical abilities being tested for different levels of understanding, different art functions and to maintain the subject's interest. The art works for each sub-set of questions were mounted on black card and placed in plastic wallets. Small coloured circles of paper were used for subjects to identify paired artworks, and numbers for three artworks. The visual examples (Appendix V) were good quality A4 prints, derived from the Open University Resource Packs.

The six sub-sets of questions tested increasingly complex critical functions. The first four sub-sets used open questions to promote pluralistic responses for visual abilities. The last two sub-sets used closed questions to promote deductive responses for contextual abilities. Closed questions at the end of the test also accommodated any reduction in concentration. Questions to test the reflective abilities, which were designed to elicit reasoned support for responses were incorporated into the sub-sets as appropriate e.g. What...?; How can you tell?; Why do you think that?. The purpose of each of the sub-tests was described in simple terms to the subjects.

The first sub-set of questions tested the presence of the ability to use a related conceptual sequence of description, and analysis to make a visual interpretation of meaning, for a single artwork. The questions were separated into three sections to test the use of data from three visual sources i.e. subject-matter; structure; formal

elements and treatment. Evaluative questions were included in the structure and the treatment section. The artwork selected for testing the use of visual data was: 'The Bar at the Folies Bergere' (Manet, 1981-2A. Appendix V).

The second sub-set asked for an evaluation of a contemporary interpretation of Manet's work. The reference was selected for its relevance to the visual example, and concrete and abstract levels of comprehension e.g. *Men and women are shown exactly as we see them..... without bothering about correct lines and minute details (like traditional art and is by) a painter of genius* (Thore, 1986 pp. 48-49).

The third sub-set of paired questions tested the presence of the ability to relate the artist's methods of constructing appearance to Utilitarian, Contextual, Expressive, and Formalist interpretations. Three paired visual examples were selected to promote implicit comparisons of different methods, artist's styles and purposes (social/religious/ political/artistic) for each function.

The paired artworks were:

- 1) 'Marriage al la Mode Part 2: The Breakfast Scene' (Hogarth, 1748 Appendix V) and 'The Execution of Emperor Maximilian' (Manet, 1867B Appendix V) to represent Utilitarian/Contextual functions (social realism);
- 2) 'Dead Christ Supported by the Virgin and St. John the Evangelist' (Bellini, 1460 Appendix V), and 'Woman with a Hat' (Matisse, 1905 Appendix V) to represent literal and technical Expressive functions;.

3) 'Composition with Red, Black, Blue, Yellow and Grey' (Mondrian, 1920 Appendix V) and 'Picture with a White Border' (Kandinsky, 1913 Appendix V) to represent geometric and abstract formalist functions.

The fourth sub-set of questions tested the presence of the ability to make holistic interpretations. One of the six visual examples which accompanied sub-set three was selected by the subject for this section. The selection of a specific example counteracted the possibility of conferring among the subjects being tested.

The fifth sub-set of questions tested the contextual ability to use the artist's intention to relate art to society. A further visual example was selected from sub-set three by the subject, in order to maintain continuity of information.

The sixth and final subset of questions, tested the presence of the contextual ability to use stylistic analysis and art history to relate an artwork to its historical-geographical context. Three new visual examples, were selected to represent traditional and 'modern' styles from different artists and geographical-historical contexts. These artworks were:

1. 'The Virgin with St. Anne, Christ and a Lamb' (Leonardo, 1499-1517; Renaissance; Italy Appendix V)
2. 'Sunday Afternoon on the Island of La Grande Jatte' (Seurat, 1864-6; post-impressionist; France Appendix V);
3. 'I and the Village' (Chagall, 1911; surrealism/expressionism; Russia Appendix V).

There were three slightly different versions of the critical abilities test, because some of the language was adjusted to match the understanding of the three age groups tested. The C.A.T. along with examples of the ten artworks are shown in Appendix V.

5.2.2.2. The Modes of Reasoning Test

The modal measure was designed to provide an objective measure of learning development in art by measuring cognition through the critical capacities employed in art criticism. The modal measure assessed the operational level of responses to the C.A.T. Critical capacities were assessed through explanations, which were regarded as operational acts. Statements provided the evidence for grading the operational level of the explanation according to the mode of thinking, by which concepts were expressed. The art critical modal measure had five categories for grading the operational level of response:

1. Tautological reasoning was rated as an early concrete level;
2. Circumstantial reasoning was rated as a late concrete level;
3. Theoretical reasoning was rated as a formal level;
4. a defaultive category rated the inadequate or simple use of higher level concepts e.g. clothes out of date, as a late concrete level of response;
5. a vacuous category which was indicated by responses that did not provide evidence of the presence of the critical ability.

The operational levels were assessed through the use of:

1. increasingly sophisticated terms, relations and comparisons;

2. increasingly complex methods of justification by the complexity of the associations with physical reality, techniques and psychological states.

The assessment methodology assumed that:

- a) that art critical enquiry corresponded with literary or semantic forms of strategy evaluation;
- b) that the assessment of interpretive and reflective abilities would co-ordinate the multi-logical (deductive, debate and problem solving) and multi-functional (Utilitarian, Contextual, Expressive, Formalist) methods of enquiry;
- c) the decoding of visual cues corresponded with textual methods of decoding information (Sternberg, 1987) and could be assessed through the use of content dominated and external sources of information (Bruner, 1966; Peel, 1971);
- d) that critical development in art would follow a measurable operational sequence.

There now follows a description of the criteria for assessing art critical abilities in the matrix order of descriptive, analytic, interpretive, evaluative, contextual and reflective abilities. Each ability from the matrix was matched with the question from the C.A.T. with the appropriate notation. The cognitive criteria were described in art critical terms. If possible collective criteria were given for the assessment of the phases of the art critical strategy and the contextual abilities.

5.2.2.2.1. The Assessment of the Descriptive Abilities.

The descriptive abilities and matching questions for the visual elements, structure and treatment were as follows.

Ability	Question
D1. to name items;	P1f1a. Say what you can see in the picture.
D2. to name formal qualities;	P1f2b. Where has the artist placed the main things in the picture?
D3. to name the position; of the visual elements;	P1f3g. What tools and materials did the artist use to make this picture?
D4. to name tools and materials;	P1f1a. Say what you can see in the picture.
D5. to use generalised definitions;	

The cognitive functions for descriptive abilities, based on observation of physical reality were related to the ability to classify visual relations by:

- a) sorting the constituent parts of items into a list of names, or generalising the constituent relations into a definition i.e. naming the visual elements as items, and tools and materials for the treatment, and giving generalised definitions e.g. festival, angular design;
 - b) naming the relations between items in narrative three dimensional terms e.g. the room they are standing in, or schematic two dimensional terms e.g. left, right, top, side bottom;
- The operational levels of the descriptive abilities were assessed through the use of increasingly sophisticated: literal associations with the subject matter; spatial associations for the structure and technical associations with the formal elements and treatment.

The following combined operational criteria were used:

1. Tautological (ECO) references based on an implicit correspondence with physical reality for:
 - a) simple naming of specific items/tools/materials;

b) simple location of one item in real space or schematic relations as right and left;

2. Circumstantial (LCO) references based on an explicit correspondence and comparison with physical reality for:

a) complex naming, using literal and technical terms;

b) complex location of several items in real space e.g. background, and schematic references to the picture as a whole e.g. middle, corner;

3. Theoretical (FO): references based on generalisations of the visual elements, or their position.

5.2.2.2.2. The Assessment of the Analytic Abilities.

The cognitive functions for the analytic abilities were related to the ability to decode the artist's method of constructing visual relations for thematic and formal unity. However, there were different methods for decoding the visual elements, structure and treatment, which necessitated separate descriptions of their assessment.

5.2.2.2.2.1. The Analysis of the Visual Elements.

Literal psychological and technical associations were used to analyse or decode observations of the visual elements. However, as their application differed for the subject matter and the formal elements, their assessment required a separate description.

5.2.2.2.1.1. The Analysis of the Subject Matter.

The decoding of the subject matter as signs (iconography) was assessed through literal/spatial and psychological associations, which required different methods of assessment. The abilities and questions for assessing the literal decoding of the subject matter were as follows:

Abilities	Question
ASM1. to decode signs in literal terms;	P1f1b/d. Describe one item in detail. Can you say what it is used for or doing?
ASM2. a symbolic decoding of literal sources;	no testing undertaken
ASM5 to infer a realistic scene.	P1f1g/h. Where do you think the (people) are? Why?
.....	

The presence of the ability to make a literal decoding based on a correspondence with physical reality was assessed through the abilities to:

- a) name the function (role/use) from a narrative description of an item (person or object);
- b) infer a realistic scene (the pictorial function) from the background features by using a narrative description of a place or location.

The operational level of literal associations was assessed through the use of increasingly complex names to:

- a) to identify the constituent parts of items and their function;
- b) identify a realistic scene.

The following operational criteria were used:

Tautological (ECO): a simple naming of single features from the constituent parts to identify the function of items and the pictorial context;

Circumstantial (LCO): complex terms naming of the constituent parts e.g. collective nouns; details, explicit comparison of similarities and differences; and the use of a few features to identify functions and the pictorial context;

Theoretical (FO): abstract generalisations of the constituent parts and functions of items; chronological associations for the realistic context.

The abilities and questions for assessing the psychological decoding of the subject matter were as follows.

Abilities	Question
ASM3. infer thoughts	P1f1j. By looking try to guess
ASM4. infer feelings	what the people are thinking or feeling.
ASM6. infer moods and atmosphere s.	P1f1i. What mood, feeling or atmosphere is suggested?
.....	

The presence of the ability to make a psychological decoding based on associations with mental states was assessed through the abilities to:

a) decode pose, gesture, facial expression to state another persons thinking or emotive response,

b) to make an emotive association with the background features by naming a mood, atmosphere or feeling.

The operational level was assessed according to the complexity of the psychological associations. However, literal associations with thoughts and emotive associations with feelings, moods and atmospheres required different kinds of assessments and developed at different levels. The following operational criteria were used to assess a psychological decoding of the subject matter:

Tautological (ECO): simple and subjective references to a person's thoughts only;

Circumstantial (LCO): references that stated another persons thoughts and feelings and named moods and atmospheres.
Theoretical (FO): generalised references to thoughts and feelings as ideas, issues, beliefs, values; moods and atmospheres.

5.2.2.2.1.2. The Analysis of the Formal Elements.

The abilities and questions to for assessing the decoding of the formal elements were as follows:

<u>Abilities</u>	<u>Question</u>
AFE1. to decode the physical qualities;	P1f3b. How has the artist used the (selected) formal element?
AFE2 to identify textures; (selected item).	P1f1c. Imagine you can touch it What would it feel like?
AFE3. to decode abstract qualities.	P3b. What is it about? (geometric/expressive works).
AFE4/5. to infer emotive qualities (from colour);	P1f3d/e. Is the colour scheme warm, cold or neutral? Why?

.....
The decoding of formal elements was assessed through the complexity of the literal, abstract and emotive associations, with the artist' s production of surface marks, which required prior technical knowledge. The different realistic, abstract and emotive methods of processing visual information required separate methods of assessment.

The presence of the ability to make a literal decoding of the physical qualities, through the artist's use of formal elements was indicated by:

i) the naming of techniques, through an observed correspondence of surface marks with techniques;

ii) the naming of the physical qualities as textures, through tactile associations.

The operational level was assessed through the use of more complex physical and technical terms. The following operational criteria were used:

Tautological (ECO): simple terms for physical qualities;

Circumstantial (LCO): naming the physical properties, textures, techniques and comparisons of properties and techniques;
 Theoretical (FO): hypotheses (e.g. so that, probably) and theoretical comparisons.

The presence of the ability to decode the abstract qualities of formal elements, was indicated by analogous associations with physical properties, for non-representational works of art. The operational level of the ability to make analogous associations was assessed through the late concrete ability to decentre for analogous comparisons. The following operational criteria were used:

Tautological (ECO): no analogous references;
 Circumstantial (LCO): analogous references in realistic terms;
 Theoretical (FO): analogous references as abstract generalisations.

The presence of the ability to infer emotive qualities from the formal elements, focused on the ability to relate colour to emotions, through psychological associations with temperature (warm, cold, neutral colours). The operational level was assessed through the late concrete ability to decentre and make emotive associations. Literal associations with temperature were regarded as a pre-requisite. The operational criteria were as follows:

Tautological (ECO): pre-requisite literal references to temperature;
 Circumstantial (LCO): the emotive naming of a mood or feeling from the colours;
 Theoretical (FO): generalisations of emotions.

5.2.2.2.2. The Analysis of the Structure.

The abilities and questions for assessing ability to decode the artist's construction of the structure were as follows:

<u>Abilities</u>	<u>Question.</u>
S1. to identify realistic spatial projections.	P1f2d. How has a sense of distance, been created? (What looks close up? What looks far away?) P1f2e. What is that way of showing distance called?
S2. to infer schematic links	

a) arrangements;

b) focal points

c) a colour scheme

d) movement;

P1f2c. What has the artist done to make all the things fit together?

P1f2a. Look at the picture as a whole. What are the main things?

P1f3a/f. What is the most important thing in the picture?

What makes it look important?

P1f3a. Which formal element stands out the most?

P1f3d. Is there a colour scheme?

What? (are the main colours?)

P1f2f/g. Is anything moving or does the picture look still? Why?

.....

The ability to make a three dimensional and schematic decoding of the artist's methods of grouping the visual elements into a coherent whole required separate assessment criteria. The presence of the ability to identify realistic spatial projections from a correspondence with physical reality was indicated by naming the way that distance or depth was created e.g. near/far, isometric, perspective.

The operational level was assessed through the complexity of the spatial association. The operational criteria were as follows.

Tautological (ECO): simple narrative references for depth;

Circumstantial (LCO): references to spatial features that indicate distance;

Theoretical (FO): a generalisation of the method of constructing distance.

The presence of the ability to infer schematic links, through the coherence of spatial relations was assessed through:

i) topological relations by references to two dimensional methods of organising relations e.g. overlap;

ii) focal points, by naming the main things, important things and dominance, to include realistic and formal methods of emphasising features;

iii) colour schemes by naming colour combinations;

iv) movement by naming the visual cues that communicate movement or stillness.

The operational level of the ability to infer schematic links was assessed through the use of increasingly sophisticated language to describe spatial associations. The operational criteria were as follows:

- Tautological (ECO): simple references to a specific relation; no references to colour schemes or movement;
- Circumstantial (LCO): an explicit identification of spatial links for all schematic relations;
- Theoretical (FO): abstract spatial generalisations, and the use of spatial rules and principles for all schematic relations.

5.2.2.2.2.3. The Analysis of the Treatment.

The analysis of the treatment was separated into a decoding of the technical production and the manner of working. The abilities and questions for assessing the ability to analyse the technical production were as follows:

<u>Abilities</u>	<u>Questions.</u>
AT1. to identify the techniques;	P1f3h. How can you tell? (tools and materials) P1f3i. Can you name any of the ways the tools have been used?
AT2. to describe the use of formal elements.	P1f3b. How has the artist used the formal elements?
.....	

The presence of the ability to decode the techniques was indicated by references to the surface marks produced by tools and materials, the technical methods of using tools and the use of formal elements. The correctness of the identification was not taken into account. The operational level was determined through the complexity of the technical association. The operational criteria were as follows.

- Tautological (ECO): simple references to specific techniques;
- Circumstantial (LCO): surface marks referred to by name, and techniques related to a technical process;
- Theoretical (FO): references to technical rules, principles and assumptions.

The abilities and questions for assessing the ability to decode the manner of working were as follows:

Abilities	Questions.
To decode:	
AT3. a realistic treatment;	P2bi/ii. What makes the picture look like real life?
AT4. an emotive treatment	P2ei/ii. Why do you think the feelings were?
AT5. an abstract treatment;	P2fi/ii. What has the artist done to make the picture look interesting?
AT6. a decorative treatment.	P1f3c. Do you think the artist has made the work look decorative ? What?
AT7. differences between artworks;	P2c. Can you say what is different about these works?
AT8. to differentiate between realistic and imaginative modes of depiction;	P1fln. Has the artist made an exact made an exact copy of the world or did the artist make it up? Why?
.....	

The presence of the ability to decode the manner of working was indicated by the use of the appropriate visual associations to decode the treatment i.e.

- i) realistic associations derived from the subject matter for a realistic treatment;
- ii) emotive associations derived from the subject matter and technical qualities for an emotive treatment;
- iii) analogous and technical associations with the artist's production of interesting qualities, for an abstract treatment;
- iv) decorative associations with patterns or pretty effects;
- v) decoding differences between artworks was indicated by examples of visual differences;
- vi) differentiating between recorded (factual) and imagined (fantasy) depictions was indicated by identifying whether the work was copied or made up.

The operational level was assessed according to the complexity of the associations. The operational criteria were as follows.

- Tautological (ECO): simple literal references to visual cues for realistic, recorded and decorative treatments only; no explicit comparisons of differences;
- Circumstantial (LCO): complex literal, psychological and analogous associations from visual cues, for realistic; emotive; abstract decorative and imaginative treatments; explicit technical comparisons of differences;
- Theoretical (FO): stylistic generalisations and comparisons, for all associations and treatments.

5.2.2.2.3. The Assessment of the Interpretive Abilities.

The assessment of the interpretative abilities was given for each functional interpretation (Utilitarian, Contextual, Expressive and Formalist) and then for the holistic interpretations. The presence of all of the interpretative abilities was indicated by the ability to interpret meaning by summarising the contents into a principle of visual unity. e.g. theme, formal composition, problem solving. The operational level for all of the functional interpretations was assessed through the complexity of the explanations of thematic and formal compositional unity. However, assessing the relevance of form and meaning relations involved a combined assessment of whether the method of decoding visual information matched the interpreted function, which was found to be the case. A combined assessment was omitted as it involved repeating the assessment procedures for analysis (realistic, emotive, abstract treatments) and functional interpretations. The questions and abilities for assessing Utilitarian and Contextual interpretations were as follows.

<u>Abilities</u>	<u>Questions</u>
UTILITARIAN FUNCTIONS	
IVE1. to infer a literal theme (from subject-matter)	P1f1o. What do you think the art-work is about? What theme issue or story is shown?
IVE2/HI1aii. to infer a symbolic theme, idea, issue.	no testing of this ability.

IS1. to associate realistic space with a narrative theme;	P1f1k/l. What is happening?
IT1/HI1a. infer the life imitated; (realistic treatment).	Why do you think so?
	P2ai/ii. What is the artist trying to tell us about people and life?

CONTEXTUAL FUNCTIONS

HI1bi. to infer a social theme or message;	P2ai/ii as above
HI1bii. to relate contents to contemporary events/theories	P2ai/ii as above

The presence of the ability to interpret:

- 1a) Utilitarian thematic unity was indicated by references to people, objects and life as a narrative story, literal themes, ideas and issues, derived from a literal decoding of the life imitated e.g. Mother and baby;
- 1b) Contextual thematic unity was indicated by references to a social theme or message; contemporary events and theories derived from an historical decoding of signs. e.g. The American Civil War.

The operational criteria for assessing Utilitarian and Contextual explanations of thematic unity were as follows:

- Tautological (ECO): a narrative description of specific features as actions or stories;
- Circumstantial (LCO): references to literal themes, social activities and historical events;
- Theoretical (FO): references to: ideas, issues and social themes, historical periods time or styles, artistic or general theoretical influences on the depiction of meaning.

The abilities and questions for assessing the Expressive functions were as follows.

Abilities	Questions
HI1ci. to infer the emotions communicated (general);	P2di/ii. What moods or feelings has feelings has the artist shown?
IVE3. infer an emotive theme/ communication from the subject-matter;	as above
IT2. infer emotions from	(realistic cues)
	as above

emotive treatment (formal qualities and techniques);	(expressive cues)
IS4. to associate spatial relations with emotions.	no testing (spatial cues).

.....

The presence of the ability to interpret expressive thematic unity was indicated by references to an emotive communication, derived from decoding the intended/unintended emotions embodied in the artwork e.g. the artist's emotions.

The operational criteria for assessing Expressive explanations of thematic unity were:

Tautological (ECO): narrative non-emotive descriptions were rated as vacuous;
 Circumstantial (LCO): references to personal and objective emotive experience, from literal, expressive and spatial cues ;
 Theoretical (FO): generalisations of emotions and references to expressive art theories.

Formalist functions could be assessed through references to thematic and formal compositional unity. The abilities and questions for assessing formalist interpretations were as follows.

Abilities	Questions
THEMATIC UNITY.	
IVE5. to infer analogous themes from the formal elements.	P3a .What is the work about? (formalist art works).
COMPOSITIONAL UNITY	
HIdi. to infer the production of tion of pleasing qualities:	P2h. Do you like these artworks more or less than the ones you have been shown? Why? see problem solving.
HIdii. to infer a united composition;	
HIdiii. to infer the solution to a design problem	P2fi/ii. What hs the artist done to make the picture look interesting?
.....

The presence of the ability to interpret:

1a) Formalist thematic unity was indicated by analogous references to physical reality, derived from a realistic decoding of an abstract composition e.g. *the*

spectrum wave;

1b/c. Formalist unity and problem solving were combined, as solutions to design problems involved references to formal unity which were indicated by the following spatial and technical decoding:

- i) balance derived from a visual weighting of elements;
- ii) harmony derived from the identification of pleasing qualities;
- iii) variety, derived from the identification of interesting qualities;
- iv) resolving difficulties derived from identifying the technical problem resolved;

The operational criteria for assessing Formalist explanations of thematic and formal unity were as follows:

- Tautological (ECO): simple realistic analogies for themes; specific pleasing, interesting, spatial and technical references for formal unity;
- Circumstantial (LCO): formalist unity identified as: analogous themes; many pleasing qualities, spatial unity, interesting techniques and the resolution of technical difficulties;
- Theoretical (FO): references to compositional rules e.g. harmony; balance; unity; variety: and formalist theories that influenced the depiction of meaning or the solution to the problem.

The abilities and questions for assessing holistic abilities were as follows.

Abilities	Questions
HI5. select and make a functional interpretation;	P3b. Tell me what you think it is about?
HI2. the ability to identify a theme;	as above
HI3. to identify a title;	P3c. Can you think of a title for it?
HI4. to give an alternative interpretation;	P3d. Can you think of a different title, which would also suit the picture?
R2. to revise interpretations in the light of the visual evidence;	P1f2h. After looking at the arrangement what else have you found out about the picture?

The presence of the ability:

a) to select and make functional interpretations by defining a theme, was assessed through an explanation of what a selected artwork was about e.g. *mother and baby*;

b) to generalise the contents of an artwork into more than one interpretation, was indicated by the ability to give a title and an alternative title, as evidence of thematic interpretations e.g. *A walk in the park, a summer day*.

The operational assessment of holistic interpretations followed the previously described procedures for functional interpretations.

The presence of the ability to revise interpretations was indicated by references to items that were previously omitted. The operational level of this ability was assessed through the complexity of the references to omitted items. The following criteria were used:

Tautological (ECO): no identification of omitted items;

Circumstantial (LCO): omissions identified through a comparison of observed features or techniques;

Theoretical (FO): a generalisation of the features or techniques previously omitted.

5.2.2.2.4. The Assessment of the Evaluative Abilities.

The ability to make a functional evaluation was assessed through the ability to identify and evaluate a function e.g. Utilitarian, Expressive, Formalist. However, evaluations were limited to formalist evaluations, originality, and preference judgements. The ability and question to identify and evaluate a function or purpose was as follows:

<u>Ability</u>	<u>Question</u>
E1. to identify similar functions	P3e/f. Which picture is similar to the one you have chosen? Why do you think that?

.....

The presence of the ability to identify artworks with similar functions, was

indicated by references to examples of similar characteristics e.g.

Utilitarian examples of common features; themes; issues;

Expressive examples of common emotions;

Formalist examples of common formal elements or techniques.

The operational level would be assessed through the complexity of the comparison.

Tautological (ECO): comparisons with physical reality;
Circumstantial (LCO): thematic and technical comparisons;
Theoretical (FO): abstract generalisations of themes, techniques and functions.

The abilities and questions for a formalist evaluation of the composition and technical merit were as follows.

<u>Abilities</u>	<u>Questions.</u>
COMPOSITIONAL MERIT	
Edi. to evaluate a composition (unity, variety, balance)	P1f2i. Is this a good arrangement? What is good about it?
TECHNICAL MERIT	
Edii. to evaluate technical merit as accuracy;	P1f2i. as above
Ediii. to evaluate the use of materials:	P1f3j/k. What materials other than (the subject's selection) could the artist have used to make the picture? Would it look better?

.....

The presence of the ability to evaluate a composition was indicated by references to the degree of unity, variety, and balance, but could also include references to

technical merit as accuracy (i.e. truth to life). The operational level of the compositional evaluation was assessed through the complexity of the explanation.

The following criteria were used:

Tautological (ECO): simple narrative description of the composition and of technical accuracy;

Circumstantial (LCO): complex references to the means of achieving a good composition and technical accuracy;

Theoretical (FO): explicit references to evaluative rules e.g. unity, variety, balance, technical accuracy.

The presence of the ability to make a technical evaluation of the use of materials was indicated by:

- i) the naming of alternative materials e.g. chalks;
- ii) a comparative analysis of whether an alternative material would be appropriate for the same pictorial function e.g. paint would look better than chalk because.....

The operational levels of this ability was assessed through the complexity and appropriateness of the use of names and comparisons. The following criteria were used:

Tautological (ECO): simple alternative materials;

Circumstantial (LCO): technical terms for alternative materials and judgements of appropriateness;

Theoretical (FO): explicit assumptions given for judgements of appropriateness.

The ability and question for the stylistic evaluation of originality was as follows.

<u>Ability</u>	<u>Question</u>
E2ei. to evaluate the originality.	P1f3l. Do you think the artist has found a new way of showing the world? What do you think this new way is?
.....	

The presence of the ability to evaluate originality was indicated by references to the degree of departure from established codes and conventions, through a comparative analysis of stylistic features e.g. not original the people are the same as today. The operational level of this ability was assessed through the complexity of the stylistic differentiation. The following criteria were used:

- Tautological (ECO): differences based on specific features;
- Circumstantial (LCO): technical references for stylistic differences;
- Theoretical (FO): generalisations and explicit references to the style of working.

The abilities and questions for assessing the ability to evaluate preferences were as follows:

<u>Ability</u>	<u>Question.</u>
E2di. to evaluate pleasing qualities.	P2h. Do you like these (formal artworks more or less than the others you have been shown? Why?
R3. to comparatively evaluate the uate the merits of several artworks.	P2h. Why did you like this one the best?
R7.to give reasons for preference	as above
.....	

The presence of all the preference and reflective abilities was indicated by naming the most pleasing quality of one of several artworks. The operational level of the evaluative preference and reflective abilities was assessed through the complexity of the explanation. The following operational criteria were used:

- Tautological (ECO): simple realistic references and comparisons;
- Circumstantial (LCO): complex realistic, analogous or technical references and comparisons;
- Theoretical (FO): generalised references and comparisons of analogous and technical qualities

5.2.2.2.5. Assessing the Contextual Abilities.

The contextual abilities were assessed through the use of contextual information to support explanations. However, the intentional, stylistic, historical and critical sources of information required different methods of assessment. The abilities and questions for the ability to use the artist's intention to explain interpretations were as follows.

<u>Abilities</u>	<u>Questions.</u>
CAI1. to relate planning to the artist's production;	* P4ai. How did the artist make this work from the beginning to the end?
CAI2. to infer reasons for the artist's intention.	P4aii. Why did the artist make this work?
CAI3. to relate intentions to visual cues.	P4b. What in the work makes you think that?
CAI4. to compare own response with with the artist's intention;	P4c. Do you think the artist would agree with you? Why?
CAI5. to identify difficulties in comprehending the visual	P4d. Does anything make the picture difficult to understand? Why is that difficult?

.....
Naming the artist, and the life influences were assessed in the stylistic analysis and art history sections.

The presence of the ability to:

- a) relate the planning to the artist's production of a work was indicated by references to the sequential stages of planning the technical construction of an artwork;
- b) to infer reasons for the artist's intention was indicated by references to the artist's motives;
- c) to relate intentions to visual features was indicated by references to specific feature, a story or issue, used to identify the artist's intention;

- d) to compare own response with the artist's intention was indicated by a comparison of two points of view for intentions;
- e) to identify difficulties in comprehension was indicated by the provision of an example, and by defining specific difficulties e.g. it would be difficult to make it look real.

The operational level of the ability to identify the artist's intention was assessed through the complexity of the associations e.g. observed correspondence of features and techniques; decentering for observing sequences; motives, other viewpoints and difficulties. The combined criteria for assessing the artist's intention were as follows:

- Tautological (ECO): planning described a stage at a time; subjective motives and specific features identified;
- Circumstantial (LCO): references to: planned technical sequences; the artist's motives; literal and analogous themes; comparisons of points of view and the identification of difficulties;
- Theoretical (FO): references to the whole process of planning and production; the identification of abstract motives, themes and viewpoints; the defining of difficulties.

The abilities and questions to assess the use of stylistic analysis for explanatory support were as follows;

Abilities	Questions
CSA1. to infer the name of the artist? (from work);	P4g. Can you name the artist who made this work?
CSA2. to infer the date of the work;	P5Bb. When do you think these artworks were made? Why do you think that?
CSA3. to infer the country of origin.	P5Bc. Can you guess which different countries these artworks came from? How can you tell?
CSA4. to differentiate between past and present works.	P5Aa/b. Which of these artworks would you say were modern? Why? What would you call the others? Why?

CSA5. to classify by genre.
CSA5. to classify into styles;

no testing
P5Ad. What style-names would you
give to these pictures?

The presence of the ability to decode historical information about the artists' manner of working was indicated by:

- a) naming the artist from the signature or the artworks characteristics, for any of the six visual examples (technical deduction);
- b/c) identifying dates and the country of origin from time and space associations with physical qualities (chronological-spatial deduction);
- d) differentiating between past and present artworks by identifying chronological differences e.g. clothes; objects; techniques;
- e) naming the style of working from a chronological differentiation of the artworks characteristics e.g. Post Impressionism; not modern.

The operational level of the ability to infer from the style of working the artist, date, geographic location, past and present artworks, and styles, was assessed through the complexity of the chronological associations. The combined operational criteria were as follows:

Tautological (ECO): naming of artists, countries and chronological differences from objects, people and techniques;
Circumstantial (LCO): decentering for an observed chronological correspondence of features and techniques to name the: artist; date; country of origin; and references based on the chronological development of art-styles;
Theoretical (FO): chronological generalisations for stylistic or historical development.

The abilities and questions for assessing the ability to use art history for explanations were as follows:

Abilities	Questions
CAH1. to recognise why artworks change over time;	P5Ac. Why do pictures made at different times in history look different?
CAH2. to infer from the artwork the the art practice at the time of production.	P4f. What did artist's put in their at the time this one was made?
CAH3. to recall knowledge of the artist's life?	P4h. Do you know anything about the artist's life?
CAH4. to use knowledge of the artist's life to understand the artwork.	P4i. How does the artists life help help you understand the picture?
CAH5. to infer from an artwork life at the time of production;	P5Be/f. If you go back in history which picture tells you about life at the time of production? What issue, theme or happening is shown? What else?
CAH6. to validate inferences about the historical context;	P5Bg/h. Is your guess a true reflection of life at the time? How can you tell?

The presence of the ability to make historical associations with the physical characteristics of an artwork was indicated by:

- identifying reasons for artworks changing over time e.g. *there were different views about art*;
- references to the subject matter (codes and conventions) to infer art practice at the time of production e.g. *they liked people*.
- recalling knowledge of the artist's life as events; emotional and social influences e.g. *Goya and war*;
- a named correspondence between the artist's work and life to apply their knowledge to an understanding of the artwork e.g. *Goya painted war*;
- references to the life imitated for historical inferences about life at the time of production e.g. *they were kind to children*;

f) references to an historical source of information which supported or validated the inferences e.g. *look at other artworks painted at the time.*

The operational level of the ability make historical inferences about an artwork, was assessed through the complexity of historical associations. The combined operational criteria were as follows:

- Tautological (ECO): partial references to features and events, without an explicit historical associations;
- Circumstantial (LCO): the use of historical associations with the subject-matter or surface marks to project literal and psychological historical information, validated by circumstantial information;
- Theoretical (FO): the use of historical generalisations for social, theoretical and stylistic associations, and theoretical validation of historical information.

The ability and question to evaluate contemporary critical comments were as follows:

Ability	Question
CAC1. to comparatively evaluate critical merit.	P1C1. this is what someone said about the artist. Do you agree with them?
.....	

The presence of the ability to comparatively evaluate contemporary criticism for a specific text was indicated by giving similar examples for agreement e.g. *the people are exactly as we see them*, and different examples for disagreement e.g. *it is an impression*. The operational level of this ability was assessed according to complexity of the concepts compared for agreement or disagreement. The operational criteria were as follows:

- Tautological (ECO): a realistic comparison of simple concepts and agreement based on an observed correspondence;
- Circumstantial (LCO): a realistic comparison of all of the concepts; agreement or disagreement based on correspondence with physical reality and another viewpoint;

Theoretical (FO): abstract comparisons and theoretical reasons for agreement or disagreement.

5.2.2.2.6. The Assessment of the Reflective Abilities.

The abilities and questions for assessing reflective abilities were as follows:

Abilities	Questions.
R1. to use a critical strategy;	All of the questions to test: descriptive, analytic, interpretative and evaluative abilities
R2. To revise interpretations in the light of the visual evidence.	Question in the Interpretive section.
R3.to comparatively evaluate the merits of several artworks;	Question in the Evaluative section.
R4. to give a 'best fit' evaluation.	no testing
R5 to give explanatory support from visual sources;	Supplementary Questions which requested reasons for responses to the visual elements, structure and treatment.
R6..to give explanatory support from contextual sources;	All of the questions to test the artist's intention; stylistic analysis art history and criticism
R7. to give reasons for preferences;	Preference questions in the evaluative section.
.....	

The reflective abilities provided an overview of the abilities to:

- i) use a critical strategy i.e. describe, analyse interpret and evaluate meaning;
- ii) provide explanatory support from:
 - a) visual sources i.e. visual elements, structure, treatment;
 - b) contextual sources i.e. artist's intention; stylistic analysis; art-history;
 - c) preference judgements i.e. reasons for likes and dislikes.

The description of the assessment procedures had been subsumed in the descriptions of the visual and contextual abilities, and the ability to revise interpretations was placed with the interpretive abilities. Therefore, a collective

assessment would require a generalisation of these procedure which was undertaken in the data analysis section (Chapter 6).

5.2.3. The Allison Art Vocabulary Test.

The Allison Art Vocabulary Test (Allison, 1974) was used to test the objectivity of the modal measure, through evidence of a triangulation of scores from the A.A.V.T. the Piagetian tests and M.O.R.T. It was assumed that all three measures would be comparable because they used a Piagetian maturational scale to assess levels of concept formation through associations with spatial imagery. Allison's methodology was derived from combining Peel (1971) and Goldman's (1964), linguistic translation of Piaget's operational theories with Mc Fee's (1961), 'Perceptual-Delineation' theory which used the cognitive style of communication to assess the operational development of art concepts. Allison's linguistic measure of cognitive style, provided a multi-factor measure of cognitive and affective responses, required for art production and discourse. The diversity of response was defined by Allison's Four Domains curriculum model (Expressive; Perceptual; Analytic-critical; and Cultural-historical domains), and child art theories of development (intellectual; perceptual; inner states; embodiment; personality; hereditary and environment).

Allison measured the cognitive style of comprehending visual imagery, by relating word recognition to spatial methods of decoding visual symbols. Allison assumed that more complex methods of decoding visual spatial relations, could be related to Piaget's operational levels of spatial development (Inhelder & Piaget, 1956).

The test measured operational levels, through the spatial complexity involved in matching a given word with an equivalent visual representation, from four examples. The task required different levels of spatial abilities to use visual cues to deconstruct the physical properties of objects, in order to match a given word. e.g. classification, relational analyses and generalisations.

The test consisted of an A4 booklet with fifteen pages, and an A4 answer sheet. The format of the booklet was derived from Silverman and Hoepfner (1969), and adapted for use for English education. The booklet contained a given word followed by a row of four black and white photographs, for eighty items. The photographs were differentiated by the letters ABCD, so that subjects could select the 'best matching' picture, and record their answer to each test item on a separate answer sheet. The items were ordered in a developmental sequence of eight categories of art concepts, according to the mental operations required for naming spatial relations. The selection of the best match for all of the sequenced items, provided evidence of the subjects different levels of concept formation. The categories were adapted from Wilson (1966) and Silverman's (1962), assessment criteria. The operational categories and test items are shown in Figure 22.

The test instructions were presented in an introductory item on the front cover of the booklet, and then applied to the following eighty items. The following introductory instructions were given along with the booklet and answer sheet.

These are the instructions for the picture puzzles (point to cover). Do not open the booklet until you are told because we will begin with a practice, so that you can understand the instructions. Find the answer sheet. Fill in your name, date of birth and age in the space provided. Look at the front cover of the booklet. This shows an

FIGURE 22

THE A.A.V.T. OPERATIONAL CATEGORIES AND ITEMS.

CATEGORY 1: tools and material, for items 1-7. Preoperational levels were related to naming by class membership.

CATEGORY 2: Euclidean forms, for items 8-17. The transition from preoperational appearance to concrete conservation of solid forms, was related to naming two and three dimensional geometric forms.

CATEGORY 3: Topological geometric forms, for items 18-23. (Early) concrete levels were related to the naming of two dimensional directional relations. CATEGORY 4. Classes of art phenomena, for items 24-39. Concrete operational levels were related to generalisations of: genre from the subject matter; art forms from materials and processes.

CATEGORY 5. Perceptual art qualities for items 40-50. Concrete operational levels were related to a literal naming of formal qualities.

CATEGORY 6. Perceptual spatial qualities, for items 51-60. The transition from concrete to formal operational levels was related to a transfer from naming depth from illusionary techniques and single/ comparative viewpoints to using theoretical rules (perspective).

CATEGORY 7: Abstract properties of art, for items 61-71. The formal operational level was related to naming the structural composition, using abstract generalisations.

CATEGORY 8: Styles and schools of painting for items 72-80. Formal operational levels were related to historical generalisations of space and time, for naming styles of painting.

TEST ITEMS

Category 1.

- 1. pencil
- 2. compass
- 3. ruler
- 4. scissors
- 5. brush
- 6. palette
- 7. crayons

Category 2.

- 8. circle
- 9. squares
- 10. triangle
- 11. diamond
- 12. ellipse
- 13. cylinder
- 14. pyramid
- 15. cone
- 16. sphere
- 17. cube

Category 3.

- 18. horizontal
- 19. curve
- 20. Diagonal

- 21. vertical
- 22. straight
- 23. angle

Category 4.

- 24. painting
- 25. pottery
- 26. sculpture
- 27. sketch
- 28. portrait
- 29. still life
- 30. drawing
- 31. collage
- 32. mosaic
- 33. architecture
- 34. mural
- 35. kinetic
- 36. mobile
- 37. figure
- 38. abstract
- 39. landscape

Category 5.

- 40. Line

- 41. tone
- 42. texture
- 43. volume
- 44. concave
- 45. transparent
- 46. shape
- 47. convex
- 48. curvilinear
- 49. opaque
- 50. translucent

Category 6.

- 51. distortion
- 52. background
- 53. foreshorten
- 54. shading
- 55. elaboration
- 56. foreground
- 57. chiaroscuro
- 58. contrast
- 59. gradation
- 60. perspective

Category 7.

- 61. proximity
- 62. tension
- 63. balance
- 64. repetition
- 65. symmetry
- 66. rhythm
- 67. imbalance
- 68. harmony
- 69. scale
- 70. asymmetry
- 71. form

Category 8

- 72. realism
- 73. fauve
- 74. impressionism
- 75. figurative
- 76. cubism
- 77. surrealism
- 78. expressionism
- 79. non-figurative
- 80. genre.

example of the picture puzzles you will be doing. There are four pictures, with a word at the beginning of the row. Read the word and then find the picture which means the same as the word, or is the best example of the word. In this example the word is face. If you look at the pictures you will see that the picture of a face has a letter B under it. So, on your answer sheet you would put a cross on the letter B, along side the word face.

The instructions for item 1. were as follows.

Open the booklet. Look at item 1, you will see that the first word is pencil. Look at the pictures along side the word pencil, and you will see that the picture with a letter C underneath it is a picture of a pencil. On your answer sheet, put a cross on the letter C alongside the word pencil. In a moment you are going to answer all of the questions in the booklet, by marking the answer sheet with a cross on the matching letter. If you do not know the answer you can make a guess. Continue through the booklet until you come to the end. There is no time limit but work as quickly as you can. Check through to make sure you have completed all of the questions'. Put your hand up when you have finished. Any questions?

The instructions along with a specimen example of the booklet cover and first page are shown in Appendix VIII.

Clarification of the test procedures e.g., size of the cross, could be given in the introduction, and during the test, The supervisor checked that each item had been undertaken to provide data for assessing each operational level. The one in four possibility of random answers, was considered to be an acceptable level of error for test reliability. The test was scored by counting the number of correct answers as indicated by a master score sheet (Appendix IX), for each of the eight categories and a total score. Evidence of higher test scores provided evidence of higher levels of development. The ranked operational categories allowed analysis of inconsistencies in test scores.

The external validity of the art vocabulary test was established through an independent statistical testing of a correlation with an general vocabulary test (Progressive matrices scale, and Mill Hill vocabulary test, Raven, 1960) and two tests of projected relations (Silverman, 1967; Allison, 1974) . Statistical tests of reliability were also undertaken with a different sample of the same age range. In addition the test was standardised through further tests (Kelsall, 1978; Sherry, 1983).

5.3. Summary.

The research methodology was described for the research procedures and the three measuring instruments used to test the research hypotheses. The description of the research procedures was given for selecting the sample, the location, the test conditions, the pilot test and the implementation of the tests. The assessment methodology was described for three measuring instruments: the Piagetian tests, the Modes of Reasoning Test and the Allison Art Vocabulary Test. Revisions to the Piagetian and Modes of Reasoning test were also described. The measuring instruments provided the data to determine the three operational samples; the operational structure of art critical abilities, an operational relation with Piagetian measures and the objectivity of the modal measure. .

CHAPTER 6.

THE HYPOTHETICAL TESTING OF THE MATRIX AND MODAL MEASURE.

Data analysis of the raw scores from the three Piagetian operational tests, (Elliot, 1983), the modal measure (Stuart, 1997) and the A.A.V.T. (Allison 1974), was used to test the operational projections for the matrix and modal measure. The data analysis will be described for the Piagetian tests which selected the operational samples; the modal test which examined the tripartite structure of each ability and an operational relation with the Piagetian tests, and the triangulation of the three test scores to determine the objectivity of the measure. The data from the three measuring instruments is shown in Appendix X.

6.1. Data Analysis of the Three Piagetian Tests.

The Piagetian test scores provided three operational samples to collate and compare:

- a) the individual operational ratings from the modal measure with the operational level of the sample to determine an operational correspondence;
- b) the collective modal and vocabulary test scores to determine an operational correspondence between all three measures.

The three operational samples derived from data analysis of the representative samples raw scores from the Piagetian tests were placed in Table 1 along with the test results. The selection of the early concrete sample was based on a correct response to the conservation test (Y), but a no score (O) for the rotation test. One subject (j3) was included in the sample despite an incorrect conservation score (N)

to monitor the conservation test. The selection of the late concrete sample was based on one or more correct rotational responses, and where applicable a late concrete response (LCO) to the formal reasoning test (m8, m10 m12). One subject (m12) was regarded as a borderline case, but rated as L.C.O. because of incomplete responses. The selection of the formal operational sample was based on a formal operational rating (FO) for the formal reasoning test. The composition of the three operational samples, along with the scored responses for each representative sample are placed in Table 1.

6.2. Testing the Hypothetical Tripart Structure.

The projected operational structure of early concrete, late concrete and formal operational levels of art critical abilities was tested through the modal measure. The testing of the tripartite structure for each ability was based on evidence derived from data analysis of the subjects responses to the C.A.T., that each ability had Tautological, Circumstantial and Theoretical categories of response. After the data analysis the findings were tabulated, in order to confirm the hypothetical tripartite structure. The data analysis of the operational categories (Tautological simple responses; Circumstantial complex responses; Theoretical abstract generalisations) also provided the means of rating the operational level of each subjects art critical response for each ability. The responses were notated for the operational (ECS, LCS, FOS) and representative samples (j;m:u) and indicated by italics. The operational level of response was assessed from the complexity of the visual associations. Initially the associations were identified as literal/spatial, psychological and technical to accommodate references to thematic and formal

TABLE 1

THE THREE OPERATIONAL SAMPLES, AND TEST RESULTS FOR JUNIOR, MIDDLE AND UPPER SCHOOL SAMPLES.

1. THE THREE OPERATIONAL SAMPLES.

EARLY CONCRETE SAMPLE: j1 j2 j3 j4 j6 j8 j10 j11 j12 m3.

LATE CONCRETE SAMPLE: j5 j7 j9 m1 m4 m5 m6 m8 m11 m12

FORMAL SAMPLE: m2 m7 m9 m11 u1 u2 u3 u4 u5 u6 u7

j = junior school; m = middle school; u = upper school.

2. PIAGETIAN TEST RESULTS FOR THE JUNIOR SCHOOL SAMPLE.

Sex	F	M	F	F	F	M	M	F	M	M	F	M
Subject	j1	j2	j3	j4	j5	j6	j7	j8	j9	j10	j11	j12
Conservation	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Rotation	0	0	0	0	1	0	1	0	2	0	0	0

3. PIAGETIAN TEST RESULTS FOR THE MIDDLE SCHOOL SAMPLE

Sex	M	F	F	M	F	M	M	M	F	M	F	F
Subject	m1	m2	m3	m4	m5	m6	m7	m8	m9	m10	m11	m12
Conservation	-	-	Y	-	-	-	-	-	-	-	-	-
Rotation	1	3	0	1	1	1	4	4	5	4	4	5
Formal - Reasoning	-	-	-	-	-	-	LCO	LCO	LCO	LCO	LCO	LCO
	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO

FO = formal operations LCO = late concrete operations.

4. PIAGETIAN TEST RESULTS FOR THE UPPER SCHOOL SAMPLE.

Sex	M	M	F	F	M	F	M
Subject	u1	u2	u3	u4	u5	u6	u7.
Formal Reasoning	FO	FO	FO	FO	FO	FO	FO

FO = formal operations.

unity. Later analyses of multi-functional responses required a differentiation of thematic and technical responses as literal and psychological associations were used for both. Figures of the operational levels of response for each ability were placed in Appendix XI. The modal ratings for each ability were collated for each operational sample and presented in Appendix VII. Data analysis of the tripart structure of critical abilities was undertaken for:

- a) the visual descriptive, analytic, interpretive and evaluative abilities;
- b) the contextual abilities required for the artist's intention, stylistic, historical and contemporary criticism.

A summary of the assessment was given after each set of abilities.

The data analysis of the descriptive abilities highlighted a common problem in the assessment of critical abilities. This was the difficulty involved in trying to isolate description from analysis and interpretation. This was because in practice higher levels of response tended to combine description with an analysis of relations (spatial; psychological; technical) and generalisations, which could be regarded as interpretations. The modal measure accommodated these cross references for all abilities as shown in Figure 23.

6.2.1. The Tripart Structure of Descriptive Abilities.

A combined analysis was given for the three abilities to name items, visual elements and give generalised definitions and separate analyses were given for the ability to name the position and the tools and materials.

FIGURE 23

MODAL CROSS REFERENCING.

Abilities	Levels of Response		
	TAUTOLOGICAL	CIRCUMSTANTIAL	THEORETICAL
DESCRIPTIVE definitions	simple names;	complex names;	abstract
ANALYTIC	constituent relations. area	complex relations volume, simple rules	generalisations rules
INTERPRE-TATION	spatial associations	spatial and psycho-logical viewpoints for hypotheses	theoretical hypotheses.

.....

6.2.1.1. The Abilities to Name the Visual Elements and Give Generalised

Definitions.

The intention to assess the naming of the visual elements through the use of increasingly complex lists of names for items and groups of items required extending to include grouping by location and generalised definitions. This was because data analysis indicated that naming included the location of items and generalised definitions as only three subjects listed items (ECS j2, j12: LCS j5). A combined rating of naming, generalised definitions and location according to the highest level of response was used for the ability to name items. However, the sub-set of generalised definition provided the data for the assessment of the ability to make generalised definitions. The assessment categories for the combined rating were:

Tautological Categories: 1. Simple names and relations;

Circumstantial Categories:

- 2i.. Complex names and simple relations including comparisons with reality (like).
- 2ii. Complex names and relations.

Theoretical categories: 3. abstract generalisations for names and/or relations.

The operational categories and responses for the inclusive assessment of the ability to name items are shown in Appendix XI, Figure 1. However, the rating of the most complex use of vocabulary or relations could result in inconsistencies as subjects could use different levels of vocabulary and reasoning. There now follows a description of the separate assessments for listing items, generalisations and the location of items.

6.2.1.1.1. Listing Items and Groups of Items.

Data analysis indicated that the listing of visual elements as specific items and, groups of items included simple, complex and abstract generalised definitions.

Listing of items was assessed through the complexity of the concept named. The operational categories of response for listing the visual elements derived from data analysis were as follows.

Tautological Categories;

1. Simple names for listing:

i) items:

a) people their physical and emotive attributes;

b) objects their physical properties (size).

c) formal elements

ii) grouping of people, objects, formal elements using numbers and plurals;

iii) partial generalisations for simple names of places.

Circumstantial Categories: 2. Complex names for listing:

i) items:

a) people: physical and emotive attributes

b) objects, physical properties;

c) formal elements and media;

ii) grouping of people and objects through complex plurals, collective nouns;

iii) physical generalisations for: people, commodities, places, depth, time and place as age;

iv) comparisons with reality.

Theoretical Categories: 3. Abstract Generalisations

3i.. abstract properties from physical cues e.g. people, objects, places;

- 3ii. abstract properties from psychological cues e.g. emotions;
- 3iii. historical generalisations.

The assessment of listing the visual elements was separated into listing the subject matter, listing the formal elements and generalised definitions. The ability to name the subject matter through literal associations was assessed through:

- a) simple tautological naming of the people and objects (physical-emotive attributes and physical properties); grouping by number and plurals;
- b) complex circumstantial naming of people and objects (physical/emotive attributes, physical properties); grouping by complex plurals and collective nouns; comparisons with reality e.g. like.

There were two borderline circumstantial categories for listing. These were:

- 1. comparisons with reality (like), which could provide a L.C.O. rating for simple names and groupings.
- 2. grouping using constituent collective nouns, which were rated as L.C.O. because they required a simple generalisation of two relations.

The operational categories and responses are shown in Appendix XI, for listing people and objects (Figure 2.) and groupings (Figure 3.).

The ability to name the formal elements through technical associations, was assessed through simple tautological and complex circumstantial naming of colour and media, and generalisations of technical rules. The operational categories and responses for listing the formal elements are shown in Appendix XI, Figure 4.

There was some evidence that literal and technical listing involved similar assessment procedures i.e. simple-complex naming and generalisations of physical

properties. However, there was insufficient data to rate the ability to name formal elements and groupings. The lack of data was assumed to be due to the impressionist style of the artwork (Manet, 1881 Appendix V) which focused attention on the subject matter.

6.2.1.1.2. The Ability to Make Generalised Definitions.

The operational categories and responses for the ability to make generalised definitions are shown in Appendix XI, Figure 5. Data analysis indicated that generalised definitions for naming the subject matter required different levels of assessment. These were:

- a) tautological references to globally fused numerical and spatial generalisations e.g. lots of, everything, somewhere, or simple plurals for places e.g. bar;
- b) circumstantial generalisations of physical properties for people (role and status, amount) places and commodities (*alcohol*), depth (*background*) and historical time as age (*olden days*);
- c) theoretical generalisations involved the abstract generalisation of several physical and psychological properties e.g. *audience*, *atmosphere* as well as historical generalisations e.g. *Victorian times*. Abstract generalisations could also be rated according to uncommon usage e.g. *stance*.

Generalisations were rated according to the complexity of the literal and psychological associations with physical and abstract properties. However, only generalisations of abstract properties (physical and psychological) corresponded with formal operational levels. In addition inconsistencies in rating occurred because:

1. partial (*some*) and globally fused (*lots of*) definitions were relative, and required assessing in context;
2. at the circumstantial level complex relations within and between people were given the same rating.

3. there was no clear rule for differentiating between complex circumstantial generalisations (*alcohol, transparent*) and general theoretical abstractions (*audience, reflection*).

6.2.1.1.3. Grouping Items by Location.

Data analysis indicated that grouping items by location could be separated into three sub-sets of comparisons:

1. Spatial relations for:

a) three dimensional space which included: the relations within (inherent) and between items (people and objects) as proximity, actions in time and space and spatial reversals;

b) two dimensional space which included topological relations and the surface area of the picture frame e.g. side, left hand corner.

2. psychological technical rules e.g. dominance;

3. historical time.

The following operational categories for assessing grouping by location were derived from data analysis of responses for naming items:

Tautological Categories: 1. simple location.

1i. simple realistic space;

1ii. simple static actions:

i) pose

ii) objects' function;

Circumstantial Categories: 2. complex location.

2i. 2D area;

2ii. depth;

2iii. simple dominance rule;

2iv. spectator involvement: different spatial viewpoints;

2v. complex actions:

a. movement for people;

b. function for objects;

Theoretical Categories: 3. generalised location.

- 3i. abstract reversal of missing information
- 3ii. theoretical angles for location.

The operational categories and subjects responses for grouping by location are shown in the Appendix XI, Figure 6.

Data analysis indicated that:

1. tautological locational references required an ambiguous sub-set of realistic space for inherent and proximal relations which were described in the same language e.g. *in, front, back* as well as static movement (*standing*) and simple functions (*hold*);
2. circumstantial locational sub-sets were:
 - a) physical generalisations of depth (*background, foreground*) and area (*middle, centre*) and technical rules (*stands out*);
 - b) complex actions in time (*asking*) or functions (*contain*)
 - c) spectator involvement as a comparison of viewpoints e.g. *ladies got her back to us*.
3. theoretical locational sub-sets were:
 - a) a correct reversal of missing information (the customer in the mirror);
 - b) the theoretical use of angles to determine the location of people.

In addition references to location included probability e.g. kind of, could be, which was indicative of hypothetical thinking i.e. guesses and willingness to debate.

Probability could be assessed as either physical/ circumstantial or abstract/theoretical modes of thinking depending on use as shown in Figure 24.

Probabilities could also result in inconsistent ratings when combined with tautological names and relations.

FIGURE 24.

CIRCUMSTANTIAL AND THEORETICAL REFERENCES TO PROBABILITY FOR LOCATION.

CIRCUMSTANTIAL MODES: 1. PEOPLE AND PLACES
ECS.

m3. *standing behind some kind of bar;*

LCS

m5. *it could be a restaurant;*

FOS

m11. *back of a lady probably seen in a mirror;*

u2. *some kind of waitress;*

u3. *it could be a bar;*

THEORETICAL MODES 2. ABSTRACT GENERALISATIONS AND REVERSALS

LCS.

m8. *you're meant to be the man in the mirror;*

FOS

m9. *it might be a mirror, because the angle its at would usually be behind;*

m11 *which could also be a reflection;*

u5. *a man who is perhaps in front of the picture, as if it's a reflection*

.....

6.2.1.2. The Ability to Name the Position of Visual Elements.

Data analysis of references to the structure as naming the position, through the

location of the main things, extended the previous locational categories for

assessing relations between items. The operational categories were as follows.

Tautological Categories: 1. simple location:

1i. global fusion: random order;

1ii. simple realistic space (relations within/between items);

Circumstantial Categories: 2. complex location

2i complex realistic space:

a. complex naming with simple relations within/between items;

b. 2D area, 3D depth and reversals;

c. simple technical rules (stands out).

2ii. comparisons with reality

Theoretical Categories: 3. generalised location.

- 3i. abstract generalisation;
- 3ii. aerial and linear perspective rules.

The operational categories and responses for this ability are shown in Appendix XI. Figure 7. Data analysis indicated that all but three subjects (ECS j4, LCS j9, m5) could locate the main things in space. It was assumed that lack of understanding of the question resulted in a 'no' response. Mixed spatial references for two subjects were (LCS. j7; FOS. m11), rated according to the highest level of response. The assessment of relations between items as location was previously described with the exception of:

- a) a tautological sub-set of global fusion which was indicated by a random ordering of relations.
- b) circumstantial sub-sets for realistic space which included complex naming with simple relations, and a combined subset of depth with spatial reversals and area because of mixed spatial associations;
- c) the theoretical application of rules for aerial and linear perspective.

The presence of three operational categories for naming the position of the main things indicated that this ability had a tripart structure. However, naming the position involved an analysis of spatial relations and should be regarded as an analytic ability.

6.2.1.3. The Ability to Name Tools and Materials.

Data analysis of the ability to name tools and materials from the technical qualities of the surface marks, indicated that 'higher levels' of response tended to include relations e.g. comparisons with reality, techniques and probabilities. Therefore, the following operational categories derived from data analysis of the naming of tools and materials included listing by name and relational judgements.

Tautological Categories: 1. Simple list of tools/materials;

Circumstantial Categories:

- 2i. complex list of tools/materials;
- 2ii. tools/materials related to techniques;
- 2iii. comparisons with reality;
- 2iv. probability.

Theoretical Categories:

- 3i. technical generalisation;
- 3ii. relative argument;
- 3iii. historical comparison.

The operational categories and responses for this ability were presented in Appendix XI, Figure 8. Data analysis indicated that all but three subjects could use technical terms to name tools and materials. There was one vacuous literal reference (L.C.S. j5) and two negative responses (E.C.S. j3, L.C.S. j5). It was assumed these subjects were unable to make simple technical inferences. There was one 'higher level' borderline case (L.C.S. m4. *effect*), which was rated at F.O. as an abstract generalisations. Assessment of the operational level of naming tools and materials was through increasing complex technical associations with the surface marks. The two lower level categories of simple and complex listing of tools and materials with comparisons with reality and probability indicated that this ability had a bipart structure. However, the circumstantial and theoretical categories also included comparisons with techniques, which involved a technical analysis. Therefore, it was decided to include the assessment of the analytic ability to identify techniques in this section.

6.2.1.3.1. The Ability to Identify Techniques.

The operational categories for the ability to identify techniques were derived from data analysis of increasingly complex technical associations with the surface

marks. However, the data was derived from reasons for the detection of tools/materials and references to the ways that materials were used. These responses extended the previous operational categories for assessing technical comparisons, and were as follows.

Tautological Categories: 1. a simple technique/physical property;

Circumstantial Categories:

- 2i. one complex technique associated with the physical qualities;
- 2ii. a comparison of two techniques;
- 2iii. technical relation with the subject matter;
- 2iv. comparison with reality;
- 2v. probability ;

Theoretical Categories: 3 technical generalisations;

- 3i.. technical, stylistic, evaluative rules;
- 3ii. a relative argument.

The operational categories and responses for this ability are presented separately in Appendix XI, with reasons for detection in Figure 9. and the ways materials were used in Figure 10. These two components were also rated separately. Data analysis of reasons for detection indicated that all but five subjects could give reasons for detection (E.C.S. j2, j3, j6, j10; L.C.S. j5). Negative responses for younger subjects were assumed to be due to a lack of decentering, to relate surface marks to technical properties e.g. *detail*; *softer* or actions e.g. *blended*. The difficulty of translating surface marks into technical terms was indicated by two subjects responses (L.C.S. m6, m10). There were two 'higher level' borderline cases, which despite the use of simple abstractions, were rated as F.O. as the application of technical rules. The classification of reasons for detection is shown in Figure 25. All samples gave some self-evident responses, although there were less associations with physical properties from the F.O.S. Comparisons of techniques

were restricted to the two 'higher level' samples, and only the F. O.S. gave rules for detection. There were also three higher level negative comparisons (m8, m9, u3), and no support from five primary subjects (ECS j2, j3, j6, j10; LCS j5).

FIGURE 25

CLASSIFICATION OF THE REASONS FOR THE DETECTION OF TECHNIQUES FOR EACH SAMPLE GROUP.

Implicit Self-evident.	Physical Properties	Technical Comparisons	Technical Rules
ECS. j1,j12.	ECS. j4, j8, j11, m3.	ECS.-	ECS -
LCS. j7, m1, m4, m5, m6	LCS. m2, m12. m10, m11.	LCS. j9, m8,	LCS -
FOS. u1.	FOS. u4.	FOS. m7, u2 u3	FOS. m9, u5, u6, u7.

.....

Data analysis of responses for the use of materials, indicated that there was one vacuous preference judgement (E.C.S. j5) and twelve negative responses (E.C.S. j1,j2, j3, j4, j12, m3; L.C.S. m5, m8, m10; F.O.S. u3, u4, u5). It was assumed that subjects lacked the flexibility to provide further technical associations. There were two borderline lower level cases, which were rated at L.C.O. because of references to the *picture* (ECS j10, L.C.S. m1), and one joint response for reasons and use (F.O.S. m9). Technical associations for both sets of data were assessed through:

a) simple tautological references to physical properties as direction, and actions e.g. *rubbing*;

b) complex circumstantial references to physical qualities (*details, soft, size, amount*), complex actions (*layers, blended*), simple sequences, comparisons with techniques, reality and probabilities;

c) theoretical technical generalisations and rules; a relative argument for the artist's intention; stylistic and evaluative rules.

The three operational categories derived from data analysis indicated a tripart structure for the ability to identify techniques.

6.2.1.4. Summary of the Testing of the Tripart Structure of the Descriptive Abilities.

Data analysis indicated that the combining of description and relations by 'higher level' subjects prevented a separate assessment of descriptive listing and relations within and between items. However, combined assessment procedures were complex as the operational level was determined according to the highest level of response for vocabulary or relational judgements. The combined assessment procedures resulted in repetition of assessment procedures in both the descriptive and analytic sections. The combined assessments of vocabulary and relations (operations) encountered the assessment inconsistencies described by Wood (1984), when linguistic and operational methodologies were combined.

Classification by name could be given equal rating with complex relations, and abstract definitions could be given equal rating with generalised rules and hypothetical argument. However, in interpretative enquiry abstract definitions, generalisations, and rules were difficult to differentiate, because they were all forms of interpretation.

6.2.2. The Tripartite Structure of Analytic Abilities.

The assessment of the fifteen analytic abilities was separated into nine abilities for the visual elements; two abilities for the structure and four abilities for the treatment or manner of working.

6.2.2.1. The Abilities for Decoding the Visual elements.

The nine abilities for decoding the visual elements were assessed through the complexity of naming and locating items. Separate assessments were undertaken for literal and psychological analyses of the subject matter, and literal, abstract and emotive analyses of the formal elements.

6.2.2.1.1. A Literal Decoding of the Subject Matter.

Data analysis indicated that the two abilities for a literal decoding of signs (people and objects) and a realistic scene required different assessment procedures.

6.2.2.1.1.1. The Ability to Decode Signs in Literal Terms.

Data analysis indicated that the ability to use literal associations to decode signs (people and objects) involved three assessment procedures:

- i. the naming of items;
- ii. the naming of constituent parts;
- iii. the naming of items and locational actions for functional relations between items.

All assessments were based on the complexity of the literal associations. There were two operational categories for assessing the naming of items (objects and people):

- a) Tautological: simple definitions;
- b) Circumstantial: complex definitions.

The operational categories and responses for assessing definition of items are shown in Appendix XI, Figure 11. All subjects were able to select an item by name. Seventeen subjects selected people, and fourteen subjects selected objects.

Early and late concrete samples showed a slight preference for people. However, only the LCS selected all the people (m4, m5) and an attribute (m12, *dress*). The FOS. showed an slight preference for objects. Data analysis indicated that descriptions of the constituent relations of people focused on attributes and objects focused on physical properties. Therefore, separate but parallel assessment procedures were required. The following parallel operational categories for decoding the constituent parts of people and objects were derived from data analysis.

PEOPLE	OBJECTS
TAUTOLOGICAL CATEGORIES	
1. Simple attributes named	1. Simple physical properties named and simple location.
CIRCUMSTANTIAL CATEGORIES	
2. Complex attributes named.	2. Complex physical properties named
3. Complex attributes/simple location.	3. Complex physical properties/complex location
4. Complex actions: movement.	4. Complex actions: movement.
5. Emotive attributes.	5. Analogy: sequence.
6. Comparisons with reality.	6. Comparison with reality.
7. Probability.	7. -
THEORETICAL CATEGORIES	
8i. Abstract definition.	8i. Abstract definition.
8ii. Historical generalisation	8ii. Analogous generalisation and economic evaluation.
	8iii. Abstract technical rules for evaluation.

The operational categories and responses are shown in Appendix XI, separately for people (Figure 12) and objects (Figure 13). Both assessments were used for rating this ability as they were regarded as analyses of constituent relations. Data analysis of the methods of analysing constituent relations indicated that:

1. half of the ECS used lists (ECS. j1, j2, j4, j10, j12. LCS. J5);

2. all operational samples referred to constituent relations (ECS j3, j8, j12; LCS. j7, m1, m5, m12; FOS. m9, u1, u2, u3);
3. a few subjects from the ECS (j6,) and LCS.(m4, m6. M10) referred to actions;
4. mainly FOS used 2D physical generalisations e.g. *middle, stands out* (LCS m8, FOS m2, u5, u7);
5. one subject from LCS (m10) and FOS (m2) used analogy;
6. the ECS and LCS used comparisons with reality;
7. only LCS (m4, m5) and FOS (u1, u4) referred to probability.

There was also evidence of self correction for definitions (ECS. j1, j2, j6; LCS. j9) and of a shift from random to sequenced descriptions with age.

The analysis of people involved decoding:

- a) simple and complex physical attributes: parts of the body; clothes (garments, material) adornments; height; build; colour. However, references to age, explicit comparisons and style of clothes e.g. fitted, required circumstantial levels;
- b) simple and complex emotive attributes;
- c) simple static actions for pose and complex action as movement;
- d) abstract definitions and historical generalisations from physical properties/attributes.

The analysis of objects involved decoding:

- a) simple properties: number shape, size, temperature, materials, colour, tone, direction;
- b) complex properties: fractions, geometric shape, materials, colour;

- c) simple and complex actions for functions;
- d) generalisations from physical properties;
- e) symbolic analogies for physical and abstract generalisations.

A literal decoding of objects also involved the use of:

- a) simple technical rules for location e.g. *stand out* (u7) and style e.g. *detail* (m11); *fancy, decorative* (u7);
- b) abstract technical rules for a comparative evaluation of cost (*expensive* m11) and style (*perfect* m7; *ordinary* u7).

Data analysis indicated that the social functions of people and objects, could be assessed through references to actions. The operational categories derived from data analysis were as follows.

Tautological Categories.

- 1i. Listing one or more simple actions/items;
- 1ii. A simple action relating two simple items;

Circumstantial Categories.

- 2i. Simple actions to relate complex items;
- 2ii. Complex actions relating two or more items;
- 2iii. Comparisons with reality;
- 2iv. Physical Probability;
- 2v. Simple Argument
- 2vi. Simple Functional Rules;

Theoretical Categories

- 3i. Generalised Social Functions;
- 3ii. Functional rules for people and objects;
- 3iii. Functional rules and comparative arguments for objects.

In order to accommodate three kinds of relations, the operational categories and responses are shown in Appendix XI. in three separate figures for: relations between people (Figure 14), relations between objects (Figure 15) and relations between people and objects (Figure 16). There were three lower level borderline

cases. One subject (L.C.S. j9) was rated at E.C.O. because of the use of simple names; two subjects (L.C.S. m7, m8) were rated as L.C.O. because of the use of complex names. There were three higher level borderline cases (L.C.S.m4, m10; F.O.S. m11) that used simple abstractions (*music/concerts, display, decorative*) which were rated at L.C.O. There was also a reversal of information in the mirror (F.O.S. u6), which was rated at L.C.O. All subjects were able to make inferences about the social functions of people (role) and objects (use) from decoding visual cues. There was some evidence that a decoding of the functions of people based on narrative actions was less complex than decoding objects which involved cause and effect relations, time predictions and functional rules. The three operational categories derived from data analysis of the ability to decode the function of items indicated that this ability had a tripart structure. However, the modal projections needed to provide separate criteria for assessing people and objects and include non literal categories for assessing the emotive attributes of people, analogies for objects and technical rules.

6.2.2.1.1.2. The Ability to Infer a Realistic Scene.

The ability to infer a realistic scene by generalising the background features, involved a separate assessment of naming and the supporting reasons. All but one subject (E.C.S. j3) could name a realistic scene. The rating of names, according to simple, complex and abstract generalisations are shown Appendix XI, in Figure 14. Data analysis of the supporting reasons for inferences, indicated that they could be assessed according to the complexity of the spatial and psychological

associations (intentions and emotions). The following operational categories were derived from data analysis of the reasons for naming a scene.

Tautological Categories:

- 1i. Simple number, plurals, location;
- 1ii. Simple actions;
- 1iii. Simple intentions;

Circumstantial Categories

- 2i. Complex number and plurals;
- 2ii. Complex actions;
- 2iii. Probable intentions;
- 2iv. Physical generalisation;
- 2v. Historical generalisation;
- 2vi. External information;

Theoretical Categories: 3. Abstract generalisations:

- 3i. Abstract definitions: social functions;
- 3ii. Abstract spatial reversal;
- 3iii. Emotive generalisations;
- 3iv. Theoretical argument (status): with abstract definitions and functional rules.

The operational categories and responses are shown in Appendix XI, Figure 17.

All but two subjects were able to make inferences for a realistic scene (E.C.S. j6, j8). It was assumed that negative responses were due to an inability to generalise relations between items. The circumstantial use of external information i.e. the *title*, was given a L.C.O. rating.

Data analysis indicated that the progression of inferences about a realistic scene, could be assessed through the following methods of uniting items or features:

- 1. a few simple factors for tautological inferences e.g. simple: number (*lots of*), plurals, location of items, social actions, size of room, intention;
- 2. a few complex factors for circumstantial inferences e.g. complex: numbers (amount), plurals, social actions, volume (*pretty full*) physical generalisations of role, depth, time, probable intentions;
- 3. abstract generalisations from several factors for theoretical inferences: e.g. abstract reversal, social functions e.g. *entertainment, celebration*, and a theoretical argument about status based on functional rules e.g. *common market place*.

The categories for three operational levels derived from data analysis indicated that this ability had a tripart structure. However, the measure needed to include actions, intentions and emotions as social functions and atmosphere which were combined with depth to infer a realistic scene. The synthesis of background features indicated that this ability was interpretive rather than analytic.

6.2.2.1.2. A Psychological Decoding of the Subject Matter.

The three abilities to psychologically decode the subject matter were assessed through the complexity of the of the psychological associations. However, the abilities to decode thoughts and feelings were assessed separately from the ability to infer an atmosphere.

6.2.2.1.2.1. The Abilities to Decode Thoughts and Feelings.

Data analysis indicated that, the assessment of the analysis of thoughts and feelings could be co-ordinated through references to simple-complex actions, and abstract generalisations. Mental states were assessed according to the complexity of the association with actions i.e. actions observed or projected as another person's speech (another viewpoint). However, feelings required an additional assessment of the simple-complex naming of emotions. The operational categories derived from data analysis were as follows.

Tautological Categories:

- 1i. Simple named feelings;
- 1ii. Simple actions (thoughts);

Circumstantial Categories:

- 2i. Complex named feelings;
- 2ii. Complex actions observed;
- 2iii. Complex actions as speech:
 - a) Thinking: actions predicted;

- b) Feelings: emotive actions;
- 2iv. Comparisons with Reality;

Theoretical Categories: 3. Abstract generalisations:

- 3i. generalised definitions (actions/empathy);
- 3ii. hypothetical social argument.

The operational categories and responses for thoughts and feelings are shown together in Appendix XI, Figure 18, as a single question was used for these abilities. A combined rating of thoughts and feelings was given, on the grounds that differences in complexity and focus were accounted for. All but three subjects (E.C.S. j4, j9; L.C.S. m10) were able to decode thoughts or feelings. One subject (E.C.S. j3) made a vacuous reference to feeling as touch. It was assumed that negative and vacuous responses were due to a lack of decentering to project/empathise with another person's thoughts or feelings. Most subjects referred to feelings or combined thoughts and feelings. Only five subjects referred to thoughts (E.C.S. j3; L.C.S. j7, m6, m8, m9). Subjects from each sample identified the source of inferences (E.C.S. j11, m3; L.C.S. m9; F.O.S. m2, m11 u3, u5). One subject made a negative comparison with reality for lack of response (u4), which was rated as F.O. for relative thinking.

The progression of the decoding of thoughts and feelings was assessed through:

1. tautological listing of simple feelings, and indirect references to thinking as simple actions e.g. *reading a book*;
2. circumstantial listing of complex feelings; complex observed actions e.g. facial expression, pose, movement and depth, mainly for emotions; speech as predictive actions for thoughts and feelings;
3. theoretical generalisations of emotions and the source of inferences e.g. *facial expression*; and theoretical social arguments.

The categories for three operational levels, from data analysis indicated a tripart structure for these abilities. However, the modal projections required the addition of simple emotions for tautological modes, and circumstantial associations of mental states with observed action and projected speech.

6.2.2.1.2.2. The Ability to Infer Moods and Atmospheres.

Data analysis indicated that, inferring an environmental mood or atmosphere involved a generalisation of emotive states for moods and analogous movement for atmosphere. Both emotive associations were assessed according to the complexity of psychological associations. The following operational categories were derived from data analysis.

Tautological Categories: 1. Simple emotive states named

Circumstantial Categories:

- 2i. Complex emotive actions;
- 2ii. Emotions related to status;
- 2iii. Complex emotive states and atmospheric movement;

Theoretical Categories: 3. Abstract generalisations:

- 3i. emotive definitions e.g. atmosphere and themes;
- 3ii. psychological rules for evaluating moods;
- 3iii. emotive exclusions: contradiction.

The operational categories and responses for the ability to infer moods and atmospheres for places are shown in Appendix XI, Figure 19. References to environmental moods and atmospheres were given a combined rating, on the grounds that both kinds of emotive associations, were derived from the same sources e.g. attributes, physical properties and actions in space and time. The following clarification was required for the assessment of theoretical categories. Formal operational ratings were given for:

1. abstract generalisations of emotive states e.g. *enjoyment*, but not actions e.g. *enjoying, relaxing*;
2. references to *atmosphere*, despite repeating the question;
3. psychological comparisons which were regarded as evaluative rules for moods e.g. *intently, normal, content*;
4. emotive exclusions which were regarded as the identification of pictorial inconsistencies or contradictions.

The progression of the ability to infer environmental moods and atmospheres was assessed through the following comparisons:

1. tautological associations with a specific human mood or feeling;
- 2a. circumstantial associations of emotions with: status from physical attributes and complex actions for relations between people;
- 2b. analogous physical generalisations (light) for moods e.g. *gloomy, dismal* and movement for atmosphere e.g. *lively, hurried*;
3. theoretical emotive generalisations of '*atmosphere*' or themes e.g. *enjoyment* (state), *celebration* (emotive actions), comparative analysis of moods and atmospheres for emotive inconsistencies, comparative psychological rules for evaluating moods.

The categories for three operational levels indicated that this ability had a tripart structure, with the reservation that tautological associations were with simple emotive states. In addition, the modal projections needed to include a distinction between moods as emotive states and atmosphere as analogous movement.

However, the synthesis of relations indicated that this was an interpretive ability.

6.2.2.1.3. Summary of the Testing of the Tripart Structure for an Analysis of the

Subject-Matter.

Data analysis indicated that the literal and psychological decoding of the subject matter e.g.

1. the physical attributes for the functions of people;
2. the physical properties for the functions of objects;
3. a realistic scene
4. mental states;
5. the mood and atmosphere of a place;

could be given an operational rating according to the complexity of the literal and psychological associations. Both associations were based on narrative descriptions. However, different analyses were made for people and objects, thoughts and feelings, moods and atmospheres. In addition, inferring a realistic scene and moods and atmospheres required a generalisation of the subject matter and were regarded as interpretive abilities.

6.2.2.2. The Abilities for Decoding the Formal Elements.

Data analysis indicated that the five abilities to decode the physical properties of formal elements, could be assessed according to the complexity of the technical associations. However, separate assessments were required for literal (two abilities), abstract and emotive (two abilities) technical associations.

6.2.2.2.1. A Literal Decoding of Formal Elements.

A separate assessment was undertaken of the two literal abilities.

6.2.2.2.1.1. The Ability to Decode the Physical Qualities of Formal Elements.

The decoding of physical properties, through the artist's use of formal elements (Manet, 1881), could be assessed according to the complexity of the technical

association with techniques and processes. The following operational categories were derived from data analysis.

Tautological Categories: 1. A simple specific technique;

Circumstantial Categories:

- 2i. Complex techniques, partial processes;
- 2ii. Technical comparisons;
- 2iii. Comparisons with reality;
- 2iv. Physical probability
- 2v. Simple technical rules;
- 2iv. Technical relation to mood;

Theoretical Categories: 3. Technical generalisations;

- 3i. abstract definitions;
- 3ii. technical rules for light and contrasts;
- 3iii. hypothetical argument.

The operational categories and responses for decoding the physical properties of formal elements are placed in Appendix XI, Figure 20. There was one borderline category of simple technical rules, which was rated as L.C.O. because of the use of simple language. There was one higher level borderline case (F.O.S. u5), which was rated as F.O. for the use of exceptions in an hypothetical argument. All but one of the subjects (ECS. j6), were able to make technical associations between physical properties and technical processes. Most subjects focused on associating light with colour qualities e.g. tone (*light, dark, bright*), *highlight, reflection*, with one textural association (L.C. S. j7). Use was mainly associated with the technical actions of drawing and painting, with some implicit associations of shape with drawing ((E.C.S. j2, j3, L.C.S. m1, m12). Subjects focused on tonal contrasts, mainly perceived as dominance, which was supported by several causal explanations (E.C.S. j8, m3; L.C.S. m4, m5, m6, m7, m8, m10; F.O.S. u2, m9, m11, u3, u5, u6, u7), including mood (F.O.S. u1). In addition to technical relations

one subject referred to the artist's intention (E.C.S. j8), and two subjects used simple evaluation (E.C.S. m3: ranking of tones and self correction; L.C.S. m4 'good').

The progression of the ability to decode the physical properties of formal elements was assessed through the following associations:

- a) simple technical terms and associations for tautological modes e.g. media (*paint*), subject matter (*coat, girl, skin*), colour tones (*light, dark, bright*);
- b) complex technical terms and relations for circumstantial modes e.g. technical actions (*draws, shading, mixed together, skill*), partial technical sequences; technical comparisons for dominance (texture, tones, tonal location, simple aerial perspective) tones related to mood, and comparisons of the subject matter with reality;
- c) theoretical generalisations for contracts/dominance (*prominent*), technical rules derived from light (*tone, reflection*) tonal contrasts for attentional focus, and hypothetical argument for tonal interest.

The categories at three operational levels indicated that this ability had a tripart structure. However, the modal measure needed to include intentions, emotions and rules.

6.2.2.2.1.2. The Ability to Identify Textures.

Subjects were directed to make associations with touch to identify textures. This required assessing through the complexity of the literal associations with the subject matter. Only three subjects (L.C.S. m4; F.O.S. u2, u7) could be assessed according to the complexity of the technical associations. The following operational categories were derived from data analysis.

Tautological Categories: 1. Simple naming of textures for people and objects;

Circumstantial Categories:

- 2i. Complex naming of textures;
- 2ii. Comparisons with reality;
- 2iii. Physical probability;
- 2iv. Social function: actions;
- 2v. Physical function: actions.

Theoretical Categories: 3. Abstract generalisation of physical properties:

- 3i. abstract definitions (objects);
- 6ii. psychological rule (people);
- 6iii. hypothetical argument (objects).

The operational categories and responses for identifying textures are shown in Appendix XI, Figure 21. There was one higher level borderline case, (E.C.S. j1 *normal*), which was rated at F.O., as a psychological rule. All but two subjects (E.C.S. j4; F.O.S. u3), were able to associate visual cues with touch, for people and objects. There was one vacuous response (E.C.S. j12 '*anything*'), in which global fusion prevented the identification of textures. In addition to textures e.g. smooth, soft, touch was associated with volume (*solid*), temperature (*hot-cold*) liquid (*wet*), and direction (*straight*). There were also references to light (*shiny*) and materials (*glass*). Five subjects used cause and effect to relate textures to the physical function of making (L.C.S. m4; F.O.S. u2, u7) and social functions of people and objects. (E.C.S. j3; F.O.S. m2).

The following assessment of the progression of the ability to identify textures, also included associations with touch:

- a) simple tautological naming of textures (*soft, straight*);
- b) complex circumstantial
 - i) naming (*solid, ridges*);
 - ii) metaphorical comparisons of textures with reality (like: *bark, petals, velvet, ice*)
 - iii) relation of textures to technical (*carved*) or social actions (*sweat*) , including psychological social relations (*harm, flustered*);
 - v) probability for both naming and social functions;

c) theoretical abstract generalisations of physical properties (*indentation*); psychological rules for people (*normal*) and hypothetical argument comparing the physical properties of objects.

The categories at three operational levels indicated that this ability had a tripart structure. However, associations with textures had a dual thematic and technical function which required including in the modal measure.

6.2.2.2.1.3. The Ability to Decode Abstract Qualities.

Data analysis indicated that the decoding of abstract qualities from non-representational artworks (Mondrian 1920 ; Kandinsky 1913 Appendix V), could be assessed according to the complexity of literal, psychological, technical associations. The following operational categories were derived from data analysis.

Tautological Categories: 1. Simple associations: colour and emotions;

Circumstantial Categories: 2. Complex associations:

2i. Comparisons with reality

2ii. Psychological: artist's intention; emotions;

2iii. Technical style.

2iv. Probability;

Theoretical Categories: 3. Abstract generalisations:

3i. abstract theme: emotive intention;

3ii. theoretical thematic argument.

The operational categories and responses for decoding abstract qualities are shown in Appendix XI, Figure 22. There were two borderline stylistic references. One (E.C.S. j6. '*messy painting*'), was ambiguous and rated as E.C.O. One (L.C.O. j9, '*the arty*'), was rated as L.C.O. because of simple language. No rating was given for this ability as responses were collated from the holistic section, which resulted

in an unequal sample (fourteen subjects). In addition most of the data analysis was undertaken in the holistic section. Most of the associations were literal, four were emotive associations (L.C.S. m6, m7; F.O.S. u3, u5), and two were technical (E.C.S. j9; L.C.O. j9). Data analysis indicated that the relation between decoding abstract qualities and abstract concepts was complex. Literal associations produced physical references e.g. *zoo*, and abstract concepts e.g. *fight in the heavens*, whereas emotive e.g. *angry, chaos*; and technical references e.g. *the arty*, produced abstract concepts. An analysis of abstract styles could produce both physical and abstract concepts.

The progression of the decoding of abstract qualities could be assessed through the following associations.

- a) simple associations with colour, emotions and style;
- b) complex relational associations from;
 - i) comparisons with reality (*life under the sea; a zoo*);
 - ii) psychological associations with the artist's intentions, and the spectators emotions or associations;
 - iii) probable associations with the artist's intention
 - iv) simple stylistic associations;
- c) theoretical abstract generalisations for a literal (*spectrum wave*) or emotive (*chaos*) theme and a theoretical thematic argument based on Utilitarian and Expressive functions.

The categories for three operational levels, indicated that this ability had a tripart structure, and that the decoding of abstract qualities could be thematic or technical. However, the modal measure required a tautological mode. In addition, most references required a generalised definition, which indicated that this was an interpretive ability.

6.2.2.2.1.4. The Ability to Infer Emotive Qualities

The ability to infer emotive qualities from warm/neutral/cold colour associations, combined the assessment of two abilities. Data analysis indicated that subjects focused on literal associations with temperature, or ambiguous warm-cold associations with colour contrasts (dominance). Therefore, the ability was assessed mainly through the complexity of the literal and technical associations. The following operational categories were derived from data analysis.

Tautological Categories:

- 1i. Simple naming of colours;
- 1ii. Assertions; and confused relations;
- 1iii. Simple associations: temperature and colour tones;

Circumstantial Categories: 2. Complex associations:

- 2i. Temperature;
- 2ii. Colour: tonal contrasts/dominance;

Theoretical Categories: 3. Abstract generalisations:

- 3i. Abstract definitions: physical properties;
- 3i. Technical rules for composition, temperature and feeling;
- 3iii. Hypothetical argument about colour association.

There were the following rules for:

a) unsupported references to neutral were rated as E.C.O. as it involved repeating the question; supported references indicated an understanding of the term and rated as L.C.O.

b) confused relations were rated at E.C.O., despite the use of complex language.

The operational categories and responses for this ability are shown in Appendix XI, Figure 23. All subjects were able to make colour associations, although six responses were unsupported (E.C.S. j1, j4, j6; L.C.S. m1, m6; F.O.S. m2). It was assumed that subjects from the tautological sample were unable to decenter and

that subjects from the two other samples lacked ranking skills. The operational categories indicated that a literal decoding of temperature was a prerequisite for emotive associations with warm and cold colours. This involved:

- a) tautological assertions, confused relations and simple associations of hot and cold with people, places or colour tones;
- b) complex circumstantial associations of temperature with the art object, the weather or tonal contrasts (colour dominance), although there were no explicit emotive associations;
- c) theoretical association of temperature with atmosphere, theoretical technical rules for colour contrasts: balance, temperature, feeling and an hypothetical argument about colour association.

The categories at three operational levels indicated a tripart structure for this ability. However the associations were literal and technical rather than emotive.

Data analysis indicated the complex nature of colour associations and the need for questions which promoted affective responses.

6.2.2.2.2. Summary of the Testing of the Tripart Structure of the Formal Analysis Abilities.

The decoding of formal elements could be assessed according to the complexity of the literal, emotional and technical associations. This indicated that formal elements could be used to decode themes and techniques. However, the different associations for each ability were assumed to be due to the focus of the question. The focus on technical use resulted in technical associations. The focus on touch resulted in literal associations with the subject-matter and techniques. The focus on temperature resulted in literal associations with temperature and technical associations with dominance, rather than emotive associations. In addition, the

associations with abstract qualities involved a generalisation of literal, emotive and technical associations, and was regarded as an interpretative ability. The possibility of a co-ordinated assessment of the visual elements (subject-matter and formal elements) based on literal, emotive and technical associations required further investigation.

6.2.2.3. The Abilities to Analyse the Spatial Structure.

The tripartite structure of all of the abilities to analyse the spatial structure, was assessed separately. This included one ability to identify realistic spatial projections, and four abilities to infer schematic links.

6.2.2.3.1. The Ability to Identify Realistic Spatial Projections.

Data analysis indicated that the ability to identify realistic spatial projections, could be assessed according to the complexity of the literal/spatial associations with depth. Assessment included a separate rating of:

a) a description of depth, which involved spatial comparisons of differences between items at the front and back, or vanishing points, and perspectival lines of direction;

b) a generalisation of the method of projecting depth;

which were given a combined rating according to the highest level of response, as shown in Appendix VII. In general combined ratings tended to give a higher score.

The following operational categories for assessing descriptions of depth were derived from data analysis.

Tautological Categories: 1. Simple location and items;

Circumstantial Categories:

- 2i. Simple technical rules:
- 2ii Implicit linear perspective: size;
- 2iii. Implicit aerial perspective: clarity;

Theoretical Categories: 3. Abstract generalisation: Composition:

- 3i. A visual technique: perspective;
- 3ii. Technical rules: linear/aerial perspective;
- 3iii. Technical contradictions: depth on a flat surface.

The operational categories and responses for describing depth are shown in Appendix XI, Figure 24, and generalising the method of projection in Figure 25.

There were four lower level borderline references to depth. as size. Two were rated at E.C.O., for references to one item (E.C.S. j6, j12). Two were rated at L.C.O. for comparisons e.g. *smaller* (E.C.S. j1, L.C.S. m7). One further subject (E.C.S. j7) was rated at E.C.O. for lack of spatial graduation. In addition the theoretical categories of visual technique and technical rules, were rated as F.O., because of the identification of meta-cognitive criteria. All subjects apart from one vacuous reference to the reflection of light from the print (E.C.S. j3), were able to use spatial associations to describe depth. These included four simplistic associations with: constituent relations (E.C.S. j12), action (E.C.S. j9), size (E.C.S. j6, j10) and depth (E.C.S. j7). Most subjects used implicit comparisons that involved ranking by:

- a) size, for linear perspective (E.C.S. j1, m3; L.C.S. j7, m1, m4, m7, m10; F.O.S. m2, u2, u5, u6, u7);
- b) clarity or detail, rather than tone for aerial perspective (E.C.S. j2, j4, j8, j11; L.C.S. m5, m12; F.O.S. m9, u3).

References to techniques and technical rules for perspective also indicated knowledge of the methods of constructing depth, as did references to the artist's intention (L.C.S. m4, m10). There was one reference to the contradiction of projecting depth onto a flat surface (F.O.S. u6) and several cause and effect relations (E.C.S. j2, j4, m3; L.C.S. j7, m1, m4, m5, m6, m8, m12; F.O.S. m9, m11, u2, u4, u5, u6, u7) mainly from higher level samples. The progression of the ability to infer realistic spatial projections was assessed through:

- a) simple spatial associations with constituent relations, size and actions;
- b) complex implicit spatial/technical comparisons of size for linear and clarity for aerial perspective;
- c) theoretical spatial generalisations for visual techniques and perspectival rules, including the contradiction of constructing depth on a flat surface

The naming of the method of spatial projection was assessed through the complexity of the spatial generalisation i.e. simple (*far away*); complex physical generalisation (*background*) and abstract generalisation of rules (*perspective*), as shown in Appendix XI. Figure 22. Thirteen subjects gave negative responses (E.C.S. j1, j4, j10, j11; L.C.S. j5, j7, j9, m5; F.O.S. m9, u2, u3, u4), and there was one vacuous non-spatial response 'looking carefully' (E.C.S. j3). The negative and vacuous responses from the primary sample, were assumed to be due to an inability to make spatial generalisations. It was assumed that a 'perspective' teaching programme in the middle school accounted for the high level of generalisations for this sample, with poor retention accounting for negative responses. Lack of theoretical knowledge, was assumed to be the cause of negative responses from the upper school sample. The categories at three operational levels

indicated that this ability had a tripart structure. However, abstract generalisations of the method of projecting space would only be possible at the theoretical level.

6.2.2.3.2. The Ability to Decode Schematic Links.

The ability to decode schematic links was assessed through four subset abilities i.e. note: arrangements, focal points, colour schemes, movement.

6.2.2.3.2.1. The Ability to Note Arrangements.

Data analysis indicated that the ability to note arrangements from the artist's method of 'fitting things together', could be assessed through the complexity of the spatial and technical associations. The following operational categories were derived from data analysis.

Tautological Categories: 1. Simple location: real space;

Circumstantial Categories

- 2i. Complex location: real space;
- 2ii. Complex techniques or sequence;
- 2iii. Simple thematic unity: realistic composition;

Theoretical Categories: 3. Abstract generalisation:

- 3i. Technical rules: compositional unity
 - A) 3D Location (real space);
 - B) Schematic balance and attention;
- 3ii. Thematic unity: realistic composition.

The operational categories and responses for the ability to note arrangements are shown in Appendix XI, Figure 26. There were two higher level borderline cases (F.O.S. m2, u2) that were rated as F.O., because of the generalisation of the method of locating items i.e. *separate, groups*. Eight subjects were unable to describe how items were grouped together (E.C.S. j1, j4, j6, j12; L.C.S. j5, j9, m5, m6, m10). This was assumed to be due to an inability to decentre make spatial and

technical associations. The majority of subjects used spatial associations for items/ groups of items. These included:

- a) ambiguous 2-3D associations with real-space e.g. *together* (E.C.S. j11; L.C.S. m12); *stacked* (E.C.S. j8, F.O.S. u2); *'standing'* (E.C.S. j11); *cluster* (F.O.S. u7);
- b) schematic relations between people and objects e.g. *on her left hand side*. (L.C.S. m5)
- c) random grouping (E.C.S. j8; L.C.S. m12, F.O.S. m2);
- d) depth (L.C.S. m8; F.O.S. m7).

Higher level samples generalised spatial relations in thematic terms, either through comparisons with reality (L.C.S. m1), as a place (L.C.S. m9) or abstract generalisations of actions with exceptions (L.C.S. m4); and spatial contradictions (F.O.S. m11). Only four subjects, mainly from the E.C.S. associated spatial construction with the making process as drawing skill (E.C.S. j2); sequences for locating items (E.C.S. j8); copying (E.C.S. j3); blending for depth (L.C.S. m9). There were also references to a variety of technical rules for compositional unity. These included:

- a) rules for constructing a realistic scene (E.C. S. m3);
 - b) schematic rules as
 - i. explicit balance (F.O.S. u4), symmetry with exceptions (F.O.S. u4), and underlying geometric unity e.g. *pyramid* (F.O.S. u1);
 - ii. psychological attention, as a sequenced scan of focal points (F.O.S. u3, u5, u7).
- There were also examples of cause and effect relations, mainly from higher level subjects: (E.C.S. m3; L.C.S. m1; F.O.S. u3, u4) and hypothetical arguments (L.C.S. m4; F.O.S. m7, m9. U2).

The progression of the ability to note arrangements was through:

- a) tautological references to simple items with simple ambiguous 2-3 dimensional relations and simple actions;
- b) complex circumstantial references to;
 - i. the location of items and actions in depth, through comparisons with reality for thematic unity;
 - ii. techniques as drawing skill or technical sequences for drawing or painting depth;
- c) theoretical abstract generalisations of location for realistic thematic unity, and technical rules for compositional unity e.g., location, balance, attention.

The categories for three operational levels indicated that this ability had a tripart structure and included analyses of thematic and formal/technical unity. However, the modal measure needed to include technical processes and rules.

6.2.2.3.2.2. The Ability to Infer Focal Points.

The three sub-set abilities for assessing the ability to infer focal points could be assessed according to the complexity of naming and associating items with dominance. However, separate assessment categories were required for each sub-set because of different kinds of associations with dominance. This will be followed by a collective description of the development of this ability to determine the tripart structure. A collective rating of these subsets is shown in Appendix VII.

6.2.2.3.2.2.1. Decoding Focal Points: Main Things.

Data analysis indicated that decoding dominance as the main things could be assessed through the complexity of literal associations with items and their location. The following operational categories were derived from data analysis.

Tautological Categories: 1. simple naming and location of main things;

Circumstantial Categories:

2i. complex naming;

2ii. Complex location;

2iii. Physical probability (size);

2iv. Simple technical rules for dominance.

Theoretical Categories: 3. Abstract generalisations.

3i. Abstract definitions of physical properties;

3ii. Abstract spatial reversal;

3iii. Technical rules for dominance.

The operational categories and responses for inferring the main things are shown in Appendix XI, Figure 27. There was one higher level borderline category of simple technical rules that was rated at L.C.O. for use of simple language.

However, the simplistic technical rule of *brighter* (E.C.S. j6) was rated as L.C.O. because of references to complex items. Data analysis indicated that decoding the main things required a generalisation of the item and was determined by the position, amount or size. All but four subjects (E.C.S. j3, j4; L.C.S. j9, m5) could list the main things. It was assumed that negative responses were due to lack of decentering to relate main things to dominant items. Six subjects only named items (E.C.S. j2, j 8, j11, j12; L.C.S. j5) whereas twenty-two subjects related dominance to:

a) the number or size of items (L.C.S. j7, m1);

b) the position through constituent relations, complex location, actions, a place (E.C.S. j1, j6, m3; L.C.S. j7, m1, m6, m8, m10, m12; F.O.S. m2, m7, m9, m11, u1, u2, u3, u4, u5, u7, generalisations of physical properties (*reflection* L.C.S. m12; F.O.S. m11, u3) and an abstract spatial reversal (L.C.S. m1; F.O.S. m2);

c) technical rules for dominance based on actions and thoughts (L.C.S. m1) or tonal contrasts (F.O.S. u6).

6.2.2.3.2.2.2. Decoding Focal Points: Important Things.

Data analysis indicated that the decoding dominance as importance or status was associated with attributes, locational actions and technical rules. However, separate ratings were given for naming and reasons for importance, which were given a combined score as shown in Figure 26.

FIGURE 26

THE COMBINED RATING OF NAMING AND GIVING REASONS FOR IMPORTANT THINGS FOR THREE OPERATIONAL SAMPLES.

EARLY CONCRETE SAMPLE

	J1	J2	J3	J4	J6	J8	J10	J11	J12	M3
a) naming	EC	LC	EC	-	-	EC	-	-	EC	EC
b) reasons	LC	-	LC	-	-	LC	-	-	EC	LC
Combined score	LC	LC	LC	-	-	LC	-	-	EC	LC

LATE CONCRETE SAMPLE

	J5	J7	J9	M1	M4	M5	M6	M8	M10	M12
a) naming	-	LC	EC	-	LC	-	LC	LC	EC	LC
b) reasons	-	EC	LC	-	LC	-	FO	LC	LC	FO
Combined score	-	LC	LC	-	LC	-	FO	LC	LC	FO

FORMAL SAMPLE

	M2	M7	M9	M11	U1	U2	U3	U4	U5	U6	U7
a) naming	-	EC	FO	FO	FO	LC	FO	FO	FO	LC	LC
b) reasons	-	LC	FO	FO	FO	FO	FO	FO	FO	LC	FO
Combined score	-	LC	FO	FO	FO	FO	FO	FO	FO	LC	FO

EC = early concrete LC = late concrete FO = formal operations.

Naming was assessed according to the complexity of the definition of items:

- a) Tautological: simple definitions of people, attributes, objects including pointing;
- b) Circumstantial: complex definition including: details, role, complex location and probability;

c) Theoretical: abstract physical or psychological definition of location.

The operational categories and responses for naming the important items as shown in Appendix XI, Figure 28.

The reasons for importance were assessed according to the complexity of the associations with social actions and technical rules with the following operational categories.

Tautological Categories: 1. Simple items and actions;

Circumstantial Categories:

- 2i. Complex location/actions;
- 2ii. Physical probability;
- 2iii. Simple Technical rules;
- 2iv. Simple thematic importance;

Theoretical Categories: 3. Abstract generalisations.

- 3i. Thematic social importance
- 3ii. Technical rules: psychological dominance;
- 3iii. Hypothetical argument: social-technical functions.

The operational categories and responses for the reasons for importance are shown in Appendix XI, Figure 29. One lower level borderline case (E.C.S. j8, *dressed up*) was rated as L.C.O. as an incomplete reference to style. The circumstantial category of technical rules was rated at L.C.O. for use of simple language.

However, there were three kinds of technical rules for dominance:

- a) location by size, number, space, action;
- b) technical tonal/colour contrasts, detail, variety;
- c) psychological interest attention and emotion.

All but seven subjects were able to name items and give reasons for importance (E.C.S. j4, j11, j10; L.C.S. j5, m1, m5; F.O.S. m2). It was assumed that lack of

understanding of importance prevented reasoned associations. It was assumed that the subject who could name items but not give reasons (E.C.S. j2) lacked decentering for reasoned associations. Several higher level subjects included locational references with the selection of important items. Most subjects selected people (a person: E.C.S. j1, m3; L.C.S. j7, m4, m6, m8, m10; F.O.S. m11, u2, u7) facial expression (F.O.S. u1, u3, u4, u5) their role (F.O.S. u6, u7) or people (E.C.S. j8; L.C.S. j7, m9).

Reasons were related to the social-thematic or technical importance of people.

Social reasons included the importance of:

- a) attributes, style of clothes with evaluations of elegance and expense;
- b) actions as pose and gesture or relations between people; e.g. *buying, selling*;
- c) spectator involvement.

Reasons for the technical importance of people included:

- a) size, amount;
- b) technical action as drawing, details or colour;
- c) technical rules for depicting importance e.g. attention, interest, the social organisation of the work.

Four subjects who selected objects (E.C.S. j2, j3, j12; L.C.S. m12) also related importance to social functions or the technical importance of the materials.

Subjects mainly from higher level samples also made references to cause and effect relations (L.C.S. m4, m12; F.O.S. m7, m9, u1, u3, u5, u7) hypotheses (E.C.S. j8; F.O.S. u2) and negative hypotheses (F.O.S. m9, u7).

6.2.2.3.2.2.3. Focal Points: The Main Formal Elements.

Data analysis indicated that decoding the main formal elements could be assessed according to the complexity of naming and making technical associations with dominance. The operational categories derived from data analysis were as follows.

Tautological Categories:

1i. Naming simple formal elements:

a) Colour;

b) Light and dark tones;

c) Shape and direction;

1ii. Formal elements associated with the subject matter.

Circumstantial Categories:

2i. Complex associations;

2ii. Simple technical rules for dominance;

Theoretical Categories: 3. Abstract generalisations.

3i. Generalisations of dominance or location;

3ii. Technical rules for dominance;

3iii. Dominance argument.

The operational categories and responses for decoding the main formal elements are shown in Appendix XI, Figure 30. There was one borderline higher level case which used an abstract reference (E.C.S. j4. *instinctively*) and was rated as L.C.O. for self evident reasoning. In addition technical rules that identified criteria for monitoring responses e.g. *contrasting*, *different kinds* were rated as F.O. All subjects selected main formal elements from a prescribed list. The selections in descending order were: twelve for colour (E.C.S. j1, j2, j8, m3; L.C.S. m5, m8, m10; F.O.S. m7, m11, u4, u5, u7); eleven for tones (E.C.S. j3, j6, j11, j12; L.C.S. j5, m4, m6, m12; F.O.S. m2, u1, u2, u3) five mixed references (E.C.S. j4; L.C.S. j7, m1; F.O.S. m9, u6) two for shape (E.C.S. j3; L.C.S. j9) with one reference to the subject matter (E.C.S. j12. *oranges*).

Almost half of the subjects only named items (E.C.S. j1, j2, j4, j6, j11; L.C.S. j5, j9, m5, m4 m6; F.O.S. m7, u1). The remaining subjects associated dominant formal elements with:

- a) the subject matter;
- b) location by amount, size and direction;
- c) technical rules for dominance e.g. location, detail, tonal contrasts, attraction;
- d) the identification of criteria for dominance, and the use of rules for dominance in an argument.

In general focal points were identified and assessed through spatial associations with the physical, psychological and technical properties of artworks. The progression of the ability to infer focal points as dominant items was assessed through the following associations:

- a) simple tautological associations with:
 - i) dominant subject matter or formal elements;
 - ii) dominant location as size, number, direction and simple actions;
- b) complex tautological associations with:
 - i) dominant location as spatial generalisations e.g. middle, background, foreground, or social actions;
 - ii) thematic dominance associated with actions, style of clothes, psychological states and spectator involvement;
 - iii) dominant techniques e.g. drawing;
 - iv) technical rules for dominance;
- c) theoretical abstract generalisations of:
 - i) the spatial location and spatial reversals;
 - ii) thematic associations with ideas, emotions and social life;
 - iii) technical rules for dominance;
 - iv) economic and stylistic evaluations of clothes.

The categories for three operational levels indicated that the three sub-sets of abilities had a tripart structure and that dominance was associated with thematic

and formal/technical unity. The projected modal measure needed to include technical rules for dominance and three dimensional location.

6.2.2.3.2.3. The Ability to Identify a Colour Scheme.

Data analysis indicated that identifying a colour scheme could be assessed through the complexity of the association with dominant colours i.e. naming or ranking colours. However, a distinction was required for associations with the main colours due to clarification of the abstract concept of a colour scheme. The following operational categories were derived from data analysis.

Tautological Categories: 1. Simple naming of main colours;

Circumstantial Categories:

- 2i. Complex naming of main colours;
- 2ii. Complex naming of a colour scheme;
- 2iii. Technical rules for colour schemes:
 - i) Physical ranking of colour;
 - ii) Psychological ranking of colour.

Theoretical Categories: 3. Abstract generalisations.

- 3i. Relative technical rules;
- 3ii. Hypothetical generalisations.

The operational categories and responses for the ability to identify colour schemes are shown in Appendix XI, Figure 31. There was one higher level borderline case (F.O.S. m7) whose reference to colour scheme was rated as L.C.O. because it repeated the question. All but one subject (F.O.S. u4) could identify a colour scheme. This was assumed to be due to lack of understanding of the abstract concept, as no clarification was given to the upper school sample. Several lower level subjects were given clarification (E.C.S j1, j2, j6, j10, j11, j12; L.C.S. j7,

m1, m5). These subjects named the main colours and two subjects included literal associations with the subject matter (E.C.S j1, j11).

Colour schemes were identified through:

- a) naming dominant colours (E.C.S. j3, j8; F.O.S. u2, u3) or no dominant colours (F.O.S. u1);
- b) technical rules for ranking colours
 - i) physical differences by amount, temperature, tonal depth, tonal contrasts (E.C.S. m3; L.C.S. j5, j9, m6, m8, m10, m12; F.O.S. m2, m7, u7) and tonal exceptions (F.O.S. u6).
 - ii) psychological differences e.g. *outgoing* (F.O.S. m9).

Two subjects referred to colour similarities (E.C.S. m3; F. O.S. u6). One subject noted the relative nature of identifying colour schemes (L.C.S. m4) and one subject made an hypothetical generalisation of the relation between colours (F.O.S. u5).

The progression of the ability to identify colour schemes was assessed through the following technical associations:

- a) simple tautological naming of the main colours and literal associations with the subject matter;
- b) complex circumstantial naming of main colours and colour schemes; physical and psychological technical rules for ranking colour difference and similarities;
- c) theoretical abstract generalisations of colour relations and relative rules for colour schemes.

The categories for three operational levels indicated that this ability had a tripart structure, with the reservation that younger subjects required clarification of the abstract concept. The projected measure needed to include technical rules for ranking colours.

6.2.2.3.2.4. The Ability to Identify Movement.

Data analysis indicated that the ability to identify movement from visual cues could be assessed through the complexity of the locational associations, mainly as actions in depth. The following operational categories were derived from data analysis and included the assessment of stillness (static action).

Tautological Categories: 1. Simple static action;

Circumstantial Categories:

2i. Complex static action;

2ii. Complex movement;

2iii. Simple technical rules for movement.

Theoretical Categories: 3. Abstract Generalisations.

3i. Generalisations of movement and life;

3ii. Technical rules for movement;

3iii. Realistic thematic argument about movement and genre.

The operational categories and responses for the ability to infer movement are shown in Appendix XI, Figure 32. Static actions associated with tautological thinking required a circumstantial category because of physical comparisons and probability. However, a globally fused comparison (E.C.S. j6) was rated as E.C.O. All subjects made associations with stillness or movement. There was one unsupported association (E.C.S j10). Eight subjects referred to both movement and stillness (L.C.S. j7, m4, m6, m8; F.O.S. m7, m11, u1, u6). Sixteen subjects associated stillness with:

- a) the static actions of people through pose or gesture e.g. *standing* (E.C.S. j8 F.O.S. m2) or made negative comparisons with movement (E.C.S. j2, j3, j6, m3; L.C.S. m5, m12);
- b) objects within the artwork (L.C.S. j7, m1; F.O.S. m9, m11, u7);
- c) the artwork (E.C.S. j4, j12; L.C.S. j5).

Eleven subjects associated movement with:

- a) peoples actions for one person (E.C.S. j11) or actions between people including depth, comparisons with reality and probability (L.C.S. j9, m10; F.O.S. u1, m7, u2, u4, u5);
- b) moving properties e.g. *light, smoke* (L.C.S. m1; F.O.S. u7).
- c) *life* (F.O.S. m11).

Subjects also gave technical rules for the depiction of active or passive movement by relating:

- a) peoples actions to pose and position (L.C.S. m1, m4, m8, m12);
- b) movement to the clarity of depiction e.g. *blurred* for movement (F.O.S. m11, u2, u4) or distinct detail and outline for static items (F.O.S. u3, u7), and different kinds of movement e.g. *active-passive; human-non human* (L.C.S. m6; F.O.S. u1, u6).

There was one theoretical argument about movement and genre for a realistic theme (F.O.S. u7).

The progression of the ability to infer movement was assessed through:

- a) tautological global fusion for movement, and simple static actions of people;
- b) circumstantial comparisons with
 - i) the art object,
 - ii) the actions of people in depth compared with reality and the use of probabilities
 - iii) simple differentiation of movement for people and objects;

- iv) technical rules for movement based on pose gesture and clarity of depiction;
- c) theoretical comparisons of movement with life, realistic thematic arguments, abstract technical rules for differentiating movement.

The categories for three operational levels indicated that this ability had a tripart structure, with the reservation that tautological subjects referred to static actions. The projected modal measure needed to include static actions for people and objects and technical rules.

6.2.2.3.3. Summary of the Testing of the Tripart Structure of the Abilities to Analyse the Structure..

Data analysis indicated that all of the spatial abilities were analytic although technical rules had a dual analytic- interpretative function i.e. criteria for understanding compositional unity. The assessment of the abilities for decoding the spatial structure for thematic and formal/technical unity could be co-ordinated through associations with location (2-3D. space and actions) technical processes and some psychological associations. A co-ordinated assessment of the visual elements and their spatial location could be derived from the previous analysis in the descriptive section (p.95) with additional psychological and technical associations e.g.

Tautological Categories:

- 1i. simple naming of items, emotions and simple location;
- 1ii. simple techniques;

Circumstantial Categories:

- 2i. complex naming of items, emotions and location;
- 2ii. complex techniques and simple technical rules;

Theoretical Categories: 3. abstract generalisations

- 3i. of items, emotions, location
- 3ii. of techniques and technical rules.

However, different abilities would require differences in assessment focus due to the different thematic and technical methods of analysing visual elements and spatial relations.

6.2.2.4. The Abilities to Decode the Treatment as the Manner of Working.

Data analysis indicated that all of the treatment abilities could be assessed through associations with techniques, themes and to a lesser extent the historical context.

Therefore, the following broad headings for operational categories could be used to assess all of the treatment abilities.

Tautological Categories : 1. Simple Manner of working.

- 1i. Decoding items (implicit drawing);
- 1ii. Decoding techniques;
- 1iii. Physical cause and assertions.

Circumstantial Categories: 2. Complex Manner of Working.

- 2i. Decoding items;
- 2ii. Decoding techniques;
- 2iii. Simple technical rules;
- 2iv. Simple thematic unity;
- 2v. Artist's intention;
- 2vi. Simple Historical Context.

Theoretical Categories: 3. Manner of Working.

- 3i. Abstract definitions: stylistic/thematic;
- 3ii. Technical rules;
 - a) techniques;
 - b) styles;
 - c) formal composition e.g. attention, balance.
- 3iii. Thematic comparisons including inconsistencies and contradiction.
- 3iv. Thematic rules.

The assessment of the treatment abilities will be described and rated separately due to variations in focus and function.

6.2.2.4.1. The Ability to Decode a Realistic Treatment.

Data analysis indicated that decoding the realistic treatments from the subject matter for social (Hogarth, 1748 Appendix V) and political (Manet, 1867B Appendix V) artworks could be assessed through the complexity of the associations with the subject-matter and techniques. The following pre-specified operational categories were used to assess references to the realistic treatment of social and political artworks.

Tautological Categories: 1. Simple Realistic Manner of Working.

1i.. Decoding items:

A. Social: the subject matter as *people* (E.C.S. j4) different *clothes* and a *house* (E.C.S. j11) and *colour* (L.C.S. m5).

B. Political: the subject matter as people, clothes, attributes, (L.C.S. j5) *smoke*, (E.C.S. J3) *trees and a wall* (E.C.S. j6);

1ii. Techniques (associated with:

A. Social: *colour mixing* E.C.S. j1).

B. Political: no examples.

Circumstantial Categories: 2. Complex Realistic Manner of Working.

2i. Decoding the subject matter:

A. Social: comparisons with reality for a place (E.C.S. j2, j10) with status (L.C.S. m5).

B. Political: *shadows* (F.O.S. u5).

2ii. Technical realism related to;

A) Social: copying (E.C.S. j3) drawing movement (E.C.S. j8) and use of media (E.C.S. j2; L.C.S. j5, j9).

B). Political: *copying* (L.C.S. j7) , *photography* (E.C.S. j2; L.C.S. j9) and a *real picture* (L.C.S. j7).

2iii. Technical Rules.

A) Social: detail (F.O.S. u2).

B) Political: drawing carefully (E.C.S. j8) with detail for items and speed of lines (L.C.S. m12) *plain colours* (E.C.S. j1) and copied landscape (L.C.S. j7).

2iv. Simple thematic unity: narrative composition.

1. Actions;

A) Social: a *fight* from scattered things (L.C.S. j7).

B) Political: *shooting* from actions (L.C.S. m8).

2. Physical Causal Explanations.

A) Social: party tiredness from walking in a large area (L.C.S. m4).

B) Political: predicted actions (L.C.S. m4) simple prejudice (E.C.S. m3) interest in an event (F.O.S. u6) and doubt from simple visual contradiction (L.C.S. m5).

2v. Artist's intention.

A) Social: no examples.

B) Political: see E.C.S. j1, j2, j8; L.C.S. m1.

2vi. Simple historical context.

A) Social: items related to *these days* (F.O.S. m7).

B) Political : theme related to past events (L.C.S. m1).

Theoretical Categories: 3. Realistic Manner of Working.

3i. Abstract definitions; no isolated examples.

3ii. Technical Rules: realistic treatment.

A) Social: *attention to detail*, facial expression (F.O.S. u3) and style (*way environment painted* F.O.S. u3; *cartooney* (F.O.S. u6).

B) Political : methods of drawing people (F.O.S. u4) attention to detail , properties of light and perspectival depth (F.O.S. u5).

3iii. Thematic comparisons: realistic composition.

A) Social; location as *surroundings* (F.O.S. m3) *a scene* (E.C.S. m3) or social disorder (F.O.S. u7).

B) Political: negative comparisons with the subject matter (L.C.S. m6) spatial contradictions (L.C.S. m2; F.O.S. u3) emotive probabilities from facial expression (L.C.S. m10) respect for wealth (F.O.S. m11) and *a different side of life* (F.O.S. m2).

3iv. Thematic rules: art functions.

A) Social: negative ideals (*not perfect* L.C.S. m1; *immaculate* F.O.S, u2) *realistic* (L.C.S. m6; F.O.S. u1)

B) Political: compositional grouping (F.O.S. m1) comprehension of a theme (F.O.S. u2) .

3v. Hypothetical Argument.

A) Social: style related to the *Victorian* period (F.O.S. m9),

B) Political : subject matter related to a present issue (F.O.S. u7).

3vi. The Historical Context.

A) Social: house related to historical time (L.C.S. m8).

B) Political: issue related to geographical historical context (F.O.S. m7).

The operational categories and responses for analysing a realistic treatment are shown separately for social (Figure 33) and political (Figure 34) artworks in

Appendix XI. There were four higher level borderline cases for Hogarth's work.

All four subjects used functional or locational generalisations (*realistic* L.C.S. m6;

F.O.S. u1; *surroundings* F.O.S. m2, m5) which were rated as F.O. There were two

higher level borderline cases for Manet's work. One simple reference to

contradiction was rated as L.C.O. (L.C.S. m5) . One functional generalisation

realistic (F.O.S. u1) was rated as F.O.

All but one of the subjects who gave a vacuous preference (E.C.S. j6 *both nice*) were able to decode a realistic treatment for a social theme, and all but three (E.C.S. j10, j11, j12) for a political theme. It was assumed that negative responses were due to an inability to associate the treatment with the subject-matter or techniques. There were almost an equal number of associations with the subject matter and techniques for the social theme and a greater number of associations with the subject matter for the political theme, as shown in Table 2. The greater number of political thematic associations was assumed to be due to greater comprehension of the theme.

Data analysis indicated that a realistic decoding could be assessed through the following technical and thematic associations

- a) simple associations with the subject-matter and techniques;
- b) complex associations with the subject matter (narrative actions, simple doubt, time comparisons or implicit drawing) and realistic techniques as drawing, copying, photography or simple rules e.g. *detail, plain, carefully*.
- c) theoretical associations with: social/political themes , issues, ideals with technical rules for realistic constructions and thematic rules for functions or the historical context as well as hypothetical arguments.

The two sets of categories for three operational levels indicated that this ability had a tripart structure. Data analysis indicated that a realistic treatment was mainly decoded through observation of the subject-matter which required relating to the composition either through techniques or the narrative location of items.

TABLE 2.

THE NUMBER OF ASSOCIATIONS WITH THE SUBJECT-MATTER AND TECHNIQUES FROM THREE OPERATIONAL SAMPLES FOR SOCIAL AND POLITICAL ARTWORKS.

1. SOCIAL ARTWORKS.

SAMPLES	ASSOCIATIONS		
	Technical	Subject-matter	Both
E.C.S.	j1, j3, j8, j12	j2, j4, j10, j11, m3	
L.C.S	j5, j9, m6, m10, m12	j7, m1, m4,	m8 m5
F.O.S.	m9, u1, u2, u5	m2, m7, m11, u4, u7	u3
	u6.		
TOTAL	14	13	3

2. POLITICAL ARTWORKS.

SAMPLES	ASSOCIATIONS		
	Technical	Subject-matter	Both
E.C.S.	j1, j2,	j3, j6, j4, m3	j8
L.C.S.	j7, j9, m12	j5, m1, m4, m5, m6, m8, m10	
F.O.S.	u1, u4, u5	m2, m7, m9, m11, u2, u3, u6, u7.	
TOTAL	8	19	1

E.C.S.= Early Concrete Sample L.C.O. =Late Concrete Sample

F.O.S.=Formal Operational Sample

6.2.2.4.2. The Ability to Decode Emotive Treatments.

Data analysis indicated that the ability to decode emotive treatments for literal (Bellini 1460 Appendix V) and formal (Matisse 1905 Appendix V) artworks, could be assessed through the complexity of the literal and emotive associations with the subject matter and techniques. The following pre-specified operational categories were derived from data analysis.

Tautological Categories: 1. Simple Emotive Manner of Working.

1i. Decoding the subject matter: implicit emotions

A) **Literal:** *way looking* (E.C.S. j1);

B) **Formal:** *way looking* (E.C.S. j1);

1ii. Techniques. A) **Literal:** no examples;

B) **Formal:** colour mixing and tone (E.C.S. j12);

1iii. Physical cause or assertions.

A) **Literal:** physical cause of harm (E.C.S. j2);

B) **Formal:** assertion (E.C.S. j2);

Circumstantial Categories: 2. Complex Emotive Manner of Working.

2i. Emotive decoding of the subject matter.

A) **Literal:** pose (E.C.S. j10), emotive states (L.C.S. j7, m1);

B) **Formal:** features (L.C.S. j9, m1; F.O.S. u6) spectator's emotions (E.C.S. j3);

2ii. Techniques. A) **Literal:** no isolated examples;

B) **Formal:** *horrible blue face brushstrokes* (E.C.S. j8) *drawing strange person, blending* (F.O.S. m9);

2iii. Technical rules for emotive treatment.

A) **Literal:** Implicit drawing related to emotive look (F.O.S. u6) pose or actions (L.C.S. j9, m6; F.O.S. m11, u3);

B) **Formal:**

a) emotions or thinking related to features (E.C.S. j11; L.C.S. m6, m8; F.O.S. m11) pose (L.C.S. m6);

b) emotive colour (E.C.S. j8; L.C.S. m4, m7; F.O. S. u1);

c) emotive dominance of facial expression (F.O.S. u3, *no feeling*), as a colour metaphor (F.O.S. m9, *burst on the eye*) or analogous ranking of tones (L.C.S. m4), temperature (F.O.S. m9) sound (F.O.S. m11, u3) emotive colours (F.O.S. m9);

2iv. Simple thematic unity: emotive narrative composition;

A) **Literal:** actions as emotive relations between people (E.C.S. j6; L.C.S. j5; F.O.S. m2); probable cause of harm (E.C.S. j3, j11) and Biblical associations (L.C.S. j7, m5, m8, m7; F.O.S. u1).

B) **Formal:** projected actions as cause of emotion (E.C.S. j5)

2v. Artist's Intention

A) **Literal:** no examples;

B) **Formal:** artist's use of emotive colour (L.C.S. m7).

2iv. Simple Historical Context: no examples.

Theoretical Categories: 3. Emotive Manner of Working

3i. Abstract definition

A) **Literal:** *sighed out* (F.O.S. u6);

B) **Formal:** abstract movement for texture and colour (F.O.S. u4).

3ii. Technical rules for emotive treatment.

A) **Literal:** implicit drawing of facial expression (L.C.S. m10; F.O.S. u2); shading and depression, spectator 'eye contact' (F.O.S. u7);

B) **Formal:** implicit drawing of facial expression (F.O.S. u2) and emotive contradiction (F.O.S. u7, *bright colours, sad expression*);

3iii. Thematic comparison.

A) **Literal:** emotive Biblical story (L.C. S. m12; F.O.S. u5);

B) **Formal:** no examples;

3iv. Thematic rules: Emotive Functions.

A) **Literal:** emotive purpose: sad *effect* or people's feelings (E.C.S. m3); emotive generalisation of a theme (*letting go* L.C.S. m9);

B) **Formal:** no examples;

3vi. Historical Context: no examples.

The operational categories and responses are placed in Appendix XI, in separate figures for the ability to decode literal (Figure 35) and formal (Figure 36) emotive treatments. There were two borderline lower level cases for Bellini's work, which were rated as L.C.O. for use of probability (E.C.S. j3) and explicit emotive associations (L.C.S. j5). There was one lower level borderline case (F.O.S. u6) for Matisse' work, which was rated as L.C.O. for explicit emotive associations. There was also one higher level case (F.O.S. u4), which was rated as F.O. for abstract emotive associations of formal elements with movement. All but four subjects (E.C.S. j4, j12; L.C.S. m1, m9), were able to decode an emotive treatment from literal sources. All but six subjects were able to decode an emotive treatment from formal sources (E.C.S. j4, j6, j10, j12; L.C.S. j7; F.O.S. m2). It was assumed that negative responses were due to an inability to associate emotions with literal or formal visual cues.

Data analysis indicated that emotive treatments were associated with:

- a) the subject matter as narrative actions or implicit drawing;
- b) techniques for emotive: features, pose, colour and dominance.

All of the subjects decoded emotions from associations with the subject matter for the literal artwork (Bellini, 1460 Appendix V). An almost equal amount of subjects decoded emotions from the subject matter and techniques for the formalist artwork (Matisse, 1900 Appendix V) as shown in Table 3. However, it was assumed that, in both cases, comprehension of the subject matter was more accessible than analysing the technical construction. There were a number of emotive causal explanations derived from the subject matter (E.C.S. j2, j6, j8, j10; L.C.S. j5, j9, m4, m5, m8; F.O.S. m2, m7, u1, u7).

TABLE 3

THE NUMBER OF EMOTIVE ASSOCIATIONS WITH THE SUBJECT MATTER AND TECHNIQUES FOR DECODING AN EMOTIVE TREATMENT OF A FORMALIST WORK, FOR THREE OPERATIONAL SAMPLES

EMOTIVE ASSOCIATIONS

SAMPLE	SUBJECT MATTER	TECHNIQUES	BOTH
ECS.	J1, J2, J3, J8	-	J11 M3;
LCS.	J5, J9, M1, M5. M6, M8, M10;	M4, M12	M11;
FOS.	U2, U5, U6.	M7, U1, U4, U3;	M9 U7
TOTAL.	14	6	5

ECS.= Early Concrete Sample LCS.= Late Concrete Sample FOS.= Formal Operational Sample.

The progression of the ability to decode emotive treatments was assessed through:

- a) simple association with the subject matter and colour for implicit emotions;
- b) complex associations with the subject matter for emotive states, actions, and technical rules for emotive drawing and painting;
- c) theoretical associations with emotions, themes and technical-thematic rules.

The two sets of categories for three operational levels indicated that this ability had a tripart structure. It was found that emotions could be implicitly associated with actions, and colour. Therefore, the modal measure needed to include implicit emotive associations with the subject matter and colour for tautological modes.

6.2.2.4.3 The Ability to Decode Abstract Treatments.

Data analysis indicated that the ability to decode abstract treatments as the difficulties involved in making interesting abstract designs, could be assessed through the complexity of the technical associations. The following pre-specified operational categories for assessing geometric (Mondrian, 1920 Appendix V) and expressive (Kandinsky, 1913 Appendix V) treatments were derived from data analysis

Tautological Categories: 1. Simple Abstract Manner of Working

1i. Decoding formal elements difficulties associated with:

A) **Geometric:** *colours, lines, shapes* (E.C.S. j4) *colour* (L.C.S. j7) *straight lines* (E.C.S. j6) and aligned colours (E.C.S. j12).

B) **Expressive:** *bright* (E.C.S. j4) *right* (E.C.S. j10) *different* (E.C.S. j6) colours, and aligning different colours (E.C.S. j12).

1ii. Techniques: difficulties associated with:

A) **Geometric:** *doing lines* (E.C.S. j10) *straight* (L.C.S. m5) and mixing colour (E.C.S. j1).

B) **Expressive:** *doing straight lines* (E.C.S. j1) colour mixing (L.C.S. j9) and length of time (E.C.S. j3).

1iii. Physical cause and assertions for difficulties:

A) **Geometric:** physical location of an art object (L.C.S. j5).

B) **Expressive:** no examples.

Circumstantial Categories: 2. Complex Abstract Manner of Working.

2i. Decoding formal elements : difficulties associated with lack of variety:

A) **Geometric:** *squares and rectangles* (F.O.S. m2) *oblongs and squares* (F.O.S. u6) limited colours and shapes (F.O.S. m11).

B) **Expressive:** no isolated examples.

2ii. Techniques and processes: difficulties:

A) **Geometric:** *care* (E.C.S. j2) *drawing straight lines* (E.C.S. j3) *avoiding smudges* (E.C.S. j8) and *colour merging* (E.C.S. j11).

B) Expressive: all fitting together (E.C.S. j2) planning (E.C.S. j8; F.O.S. m2) and resolving difficulties through variety (L.C.S. m4; F.O.S. m7) and planning (L.C.S. m4).

2iii. Technical rules: difficulties and interest:

A) Geometric: colour dominance (L.C.S. m4, m6, m8) negative variety e.g. *dull, boring, same* (F.O.S. m7, u3, u5) and plain styles (F.O.S. u1).

B) Expressive: variety as different shapes (L.C.S. m6) or boring lack of variety (E.C.S. m3) negative balance (*a mess* L.C.S. j7; overcrowding F.O.S. u3) tonal colour interest (L.C.S. m10) attention and comprehension (L.C.S. j5, m6, m12; F.O.S. u6).

2iv. Artist's intention.

A) Geometric; see L.C.S. j9, m4; F.O.S. m11, u1, u6.

B) Expressive: see E.C.S. j2, j8; L.C.S. m4, m10; F.O.S. m2, m7, m9, u3.

2v. Simple thematic unity: analogous composition:

A) Geometric: no examples.

B) Expressive: animals and a castle (L.C.S. m5).

2vi. Simple historical context.

A) Geometric: century derived from decor (F.O.S. u5).

B) Expressive: no examples.

Theoretical Categories: 3. Abstract Manner of Working.

3i. Abstract definition: no isolated examples.

3ii. Technical rules: difficulties and interest:

A) Geometric: *normal squares* (L.C.S. m10) the need for *different styles* (E.C.S. m3).

B) Expressive: a random order (L.C.S. m8) and emotive balance (F.O.S. u1).

3iii. Thematic comparisons: no examples.

6iv. Thematic rules: thematic interest:

A) Geometric: relative art preferences (L.C.S. j7) lack of interesting subject (F.O.S. u2).

B) Expressive: lack of clarity for comprehension (F.O.S. u2).

3v. Hypothetical argument.

A) Geometric: about interesting arrangements (F.O.S. m9).

B) Expressive: about balance and clarity for understanding meaning (F.O.S. u7).

3vi. Historical context: no examples.

The operational categories and responses are shown in Appendix XI separately

for an abstract decoding of geometric (Figure 37) and expressive (Figure 38)

treatments. There were three higher level borderline cases for the geometric

treatment. Two were rated at F.O. (L.C.S. m10, m12) for generalisations of

particularly and *normal* respectively. One response (F.O.S. u1) was rated as

L.C.O. for use of simple language. There were two borderline lower level cases for

the expressive treatment which were rated at E.C.O. for simple use of *right* (E.C.S. j10) and *like* (E.C.S. j3). There was also one analogous higher level case which was rated as F.O. for analogous use of *calm* (F.O.S. u1).

In both cases all but one of the subjects (L.C.S. m1) identified technical difficulties in making abstract designs look interesting. It was assumed that the negative response was due to poor comprehension of the question. In both cases all subjects used technical associations with formal elements, techniques, technical and thematic rules, apart from one thematic analogy for the expressive artwork (L.C.S. m5). In both cases over half of the subjects referred implicitly or explicitly to technical or thematic rules as shown in Table 4.

There were differences in the selection of technical-thematic rules in keeping with stylistic differences. Geometric references focused on: formal compositional unity (variety, unity, order/balance, tonal interest) the relative nature of art preference (L.C.S. j7), one thematic preference (F.O.S. u2) and an argument for effective formal composition (F.O.S. m9). There was one reference to a simple function (L.C.S. j5). In addition there were everyday terms for styles e.g. *plain*, *bold*, *normal*. Expressive references also focused on technical compositional unity with an argument about clarity and meaning (F.O.S. u7). There were a number of hypothetical responses for geometric (E.C.S. j3, j8; L.C.S. j7, m4, m8; F.O.S. m9, u7) and expressive (E.C.S. j8; L.C.S. m4, m5, m6, m8, m10; F.O.S. u5, u7) artworks

TABLE 4

THE NUMBER OF REFERENCES TO TECHNICAL AND THEMATIC RULES FOR GEOMETRIC AND EXPRESSIVE ARTWORKS FROM THREE OPERATIONAL SAMPLES.

1. TECHNICAL RULES.

i) Colour Dominance			ii) Variety		
SAMPLES	ARTWORKS.		SAMPLES	ARTWORKS	
	Geometric	Expressive		Geometric	Expressive
E.C.S.	-	-	E.C.S.	m3	m3
L.C.S.	m4, m6, m8		L.C.S.	m10	-
F.O.S.	-	m7	F.O.S.	m2 , m7, u4. u5	m7, m9
				u6	-

iii) Order/Balance			iv) Styles		
SAMPLES	ARTWORKS		SAMPLES	ARTWORKS	
	Geometric	Expressive		Geometric	Expressive
E.C.S.	-	-	E.C.S.	m3	-
L.C.S.		j7, m8	L.C.S.	m10	-
F.O.S. -	m11, u1, u5		F.O.S.	u1	-

v) Attention/Comprehension		
SAMPLES	ARTWORKS	
	Geometric	Expressive
E.C.S.	-	-
L.C.S	-	j5, m6, m12
F.O.S.	-	u4, u6

2. THEMATIC RULES.

SAMPLES	ARTWORKS	
	Geometric	Expressive
E.C.S.	-	-
L.C.S.	j7	-
F.O.S.	m2, u7	u2

.....
TOTAL RESPONSES THEMATIC/TECHNICAL RULES

GEOMETRIC 16

EXPRESSIVE 15
.....

E.C.S. = Early Concrete Sample L.C.S. = Late Concrete Sample
F.O.S. = Formal Operational Sample

The assessment of the progression of the of the decoding of technical difficulties for abstract treatments was through;

- a) simple technical associations with formal elements and techniques;
- b) complex technical associations with formal elements, techniques, simple technical for thematic or technical unity and styles;
- c) theoretical associations with technical and thematic rules for compositional unity and art functions.

The two sets of categories for three operational levels indicated that this ability had a tripart structure. Abstract treatments could be accessed at all levels of development. Therefore, the projected measure needed to include a tautological category for formal elements and techniques.

6.2.2.4.4. The Ability to Decode Decorative Treatment.

Data analysis indicated that the ability to decode a decorative treatment, could be assessed through the complexity of the associations with the subject matter, including colour. The following pre-specified operational categories were applied to the decoding of the decorative treatment of a realistic artwork (Manet, 1881A Appendix V).

Tautological Categories: 1. Simple Manner of Working.

- 1i. Decoding the subject matter: decorative people, objects, colours (E.C.S. j1, j3, j6, j8; L.C.S. m5; F.O.S. u6);
- 1ii. Techniques: simple location of items (E.C.S. j10);
- 1iii. Physical cause, assertions: one unsupported reference to pattern (j9);

Circumstantial Categories: 2. Complex Manner of Working.

- 2i. Decoding the subject matter: objects and attributes (L.C.S. j5, m1, m8; F.O.S. m11, u4) in depth (E.C.S. j11);
- 2ii. Techniques and processes: no examples.
- 2iii. Technical rules for decorative treatment included: imagination (E.C.S. j2) details for items (L.C.S. m6, m10; F. O.S. m2, m7, u3) and location (F.O.S. u2); comprehension (L.C.S. m12);
- 2iv. Simple thematic unity relating details and arrangement to a realistic scene (bar, E.C.S. m3); and the decorative function of artworks (E.C.S, j7);

2v. Artist's intention: doubt about decorative intention related to the subject matter (L.C.S. m4);

2vi. Simple historical context: no examples;

Theoretical Categories: 3. Manner of Working.

3i. Abstract definition: no isolated examples;

3ii. Technical rules relating attention to details of items and the focal point (F.O.S. u7);

3iii. Thematic decorative comparisons of fashionable things (E.C.S. j4) and items displayed on the bar (F.O.S. u1);

3iv. Thematic rules: no isolated examples;

3v. Hypothetical argument relating decoration to the subject matter and technical rules (F.O.S. u5) and doubt related to functions i.e. realistic rather than decorative (F.O.S. u9).

3vi. Historical context: no examples.

The operational categories and responses are shown in Appendix XI, Figure 39.

There were no borderline cases. All but one of the subjects' (L.C.S. j9) were able to decode a decorative treatment, either through direct associations or through doubt (L.C.S. m6; F.O.S. u5). The one exception was rated at E.C.O. for repeating the question, and lack of associations were assumed to be due to lack of decentring. Most subjects associated decoration with the subject matter as:

a) decorative items (E.C.S. j1, j6, j10, j12; L.C.S. j5, m1, m5) in depth (E.C.S. j11);

b) thematic location (E.C.S. m3; L.C.S. m8);

c) technical rules as imagination (E.C.S. j2), detail (L.C. S. m2, m10; F.O.S. m7, u2, u3) comprehension (L.C.S. m12) and attention (F.O.S. m9, u7);

d) hypothetical arguments which included technical and thematic rules (L.C.S. m8; F.O.S. u6)

There were three references to simple colour variety (E.C.S. j3, j8; L.C.S. m9).

It was assumed that lack of references to techniques was due to an implicit association of the subject matter with drawing.

The progression of the ability to decode decorative treatments for realistic artworks, was assessed through:

- a) simple associations with people, objects and colour;
- b) complex associations with items, the thematic location: simple technical rules; doubt of the artist's intention;
- c) theoretical technical rules, thematic comparisons and hypothetical arguments.

The categories for three operational levels derived from data analysis indicated that his ability had a tripart structure. However the projected measure needed to include technical rules and thematic comparisons.

6.2.2.4.5. The Ability to Decode Differences Between Artworks.

Data analysis indicated that the ability to decode differences between realistic artworks (Hogarth, 1743; Manet, 1867B Appendix V), could be assessed through the complexity of the associations with the subject matter, including colour. The following pre-specified operational categories were applied to the assessment of the decoding of differences between artworks.

Tautological Categories: 1. Simple Manner of Working.

1i. Decoding

- a) the subject matter for literal (E.C.S. j6; L.C.S. j5) and emotive (E.C.S. j6, j11; L.C.S. m7) differences;
 - b) decoding colour differences (E.C.S. j1);
- 1ii. Techniques: no examples;
- 1iii. Physical cause, assertions: no examples.

Circumstantial Categories: 2. Simple Manner of Working.

- 2i. Decoding the subject matter for literal differences (E. C.S. j1, j3);
- 2ii, Techniques: no examples;
- 2iii. Technical rules for stylistic differences as: *block colour and details* (F.O.S. u3, u5); *fancy and plain* (F.O.S. u6);
- 2iv. Simple thematic differences related to real life (E.C.S. j2; L.C.S. m4); thematic location (E.C.S. j4; L.C.S. m6; F.O.S. u5); social (L.C.O. m12; F.O.S. u4) and emotive (F.O.S. m2) actions;

2v. Artists intention: no examples.

2vi. Simple historical context: dating in terms of age (L.C.S. j9) and geographical location (L.C.S. m11);

Theoretical Categories: 3. Manner of Working.

3i. Abstract definition: no isolated examples;

3ii. Technical rules: differences in style (F.O.S. u2) as *cartoony* (E.C.S. m3), and *modern* (L.C.S. m1);

3iii. Thematic social (E.C.S. j7) and emotive (E.C.S. j10) differences including social issues (E.C.S. m3; L.C.S. m9; F.O.S. u7);

3iv. Thematic functional rules as real form (L.C.S. m10). and realistic (L.C.S. m5; F.O.S. m9, u7);

3v. Hypothetical argument: no examples;

3vi. Historical context: no examples.

The operational categories and responses for decoding differences between

artworks are shown in Appendix XI, Figure 40. There were nine higher level

borderline cases. All were rated as F.O. for abstract generalisations of style

(*modern*, L.C.S. m1), the artworks '*realistic*' function (L.C.S. m5, m10; F.O.S. u1,

u2) and themes (F.O.S. m7, m9, u7, u10). All but one of the subjects (L.C.S.

m12), decoded differences between artworks. It was assumed that lack of analysis

prevented comparisons between artworks, for the exception.

All but four subjects (E.C.S. j3; L.C.S. j5, m10 ; F.O.S. m2) referred to both

artworks. Most subjects associated differences between artworks with the subject

matter by:

a) decoding items (E.C.S. j3, j8; L.C.S. j5) and emotions (E.C.S. j6, j11; F.O.S. m7);

b) thematic associations with real life (E.C.S. j2), physical (L.C.S. j7, j9, m4;

F.O.S. u4) and emotive (F.O.S. m2) actions; emotive states (F.O.S. j10) and issues

(F.O.S. m9, u7); thematic doubt, and rules for functions (L.C.S. m5, m10; F.O.S.

u1, u2)

- c) geographical location (L.C.S. m12) and historical time as age (L.C.S. j9);
- d) technical rules for stylistic difference (E.C.S. m3; L.C.S. m1; F.O.S. u3, u6).

A few subjects included references to colour (E.C.S. j1, j8; L.C.S. m8; F.O.S. u3) and materials (F.O.S. u2) with technical rules, and themes.

The progression of the ability to decode differences between artworks was assessed through:

- a) simple associations with the subject matter for items and emotions, and colour;
- b) complex associations with items from the subject matter; thematic associations with physical and emotive actions, thematic doubt, and realistic technical rules;
- c) theoretical comparisons with realistic themes/issues and technical rules for differences in styles or comprehension and thematic rules for art functions.

The categories for three operational levels, derived from data analysis indicated that this ability had a tripart structure. The projected modal measure needed to include simple comparisons of different items, emotions and colours.

6.2.2.4.6. The Ability to Differentiate Between Recorded and Imaginative Modes of Depiction.

Data analysis indicated that differentiating between a recorded (copied) and imaginative (made-up) manner of working could be assessed through the complexity of the associations with the subject matter or techniques. The following pre-specified operational categories were derived from data analysis.

Tautological Categories: 1. Simple Manner of Working;

- 1i. Decoding the subject matter: copying or made-up associated with physical reality for: copying: a place (E.C.S. j4) food (E.C.S. j10) or made-up items (L.C.S. J5)
- 1ii. Techniques: no examples.
- 1iii. Assertions: unsupported reference to made-up (L.C.S. j5).

Circumstantial Categories: 2. Complex Manner of Working.

2i. Decoding the subject matter: copying associated with physical similarities (*people, photo*. E.C.S. j11), and made-up with physical differences (*people*, E.C.S. j3);

2ii. Techniques: no isolated examples.

2iii. Simple technical rules:

a) copying associated with accuracy (E.C.S. j1) and observational drawing (F.O.S. u6)

b) made-up associated with drawing from *memory* (L.C.S. m6; F.O.S. u6), and as a function of painting (L.C.S. j5);

2iv. Simple thematic unity:

a) copying associated with 'real' actions (E.C.S. j8; L.C.S. m4) and location of items (F.O. .S. m2);

b) made-up associated with differences between the 'real' location of items and actions and the subject matter (L.C.S. m4, m5);

2v. Artist's intention: no examples.

2vi. Simple historical context: using time as length to relate copying to the historical location (L.C.S. j7);

Theoretical Categories: 3. Manner of Working.

3i. Abstract definition: no isolated examples.

3ii. Technical rules:

a) copying associated with the accuracy of the use of spatial rules for depth (F.O.S. u1, u4);

b) made up associated with the departure from spatial rules for depth (F.O.S. u1, u4) as artistic license (F.O.S. u3);

3iii. Thematic comparisons:

a) copying associated with 'real' events (F.O.S. m7, u2);

b) made-up associated with thematic difference/novelty e.g. *mirror image* (L.C.S. m10);

3iv. Thematic rules: copying/made-up for a realistic scene (F.O.S. u2);

3v. Hypothetical argument: comparing idealism and realism. (F.O.S. m9);

6vi. Historical context associated with *Victorian* or *old fashioned* subject matter for contemporary copying (E.C.S m3; L.C.S. m12; F.O.S. m9) and retrospective made-up (L.C. S. m8, m12; F.O.S. m9), as well as the artist's birth (F.O. S. u7).

There was an additional theoretical category of relative thinking, either through insufficient evidence (E.C.S. j2; L.C.S. m1; F.O.S. u5); or the identification of relative factors (F.O.S. u2, u6, u7). The operational categories and responses for the ability to differentiate between recorded and imaginative modes of depiction, are shown in Appendix XI, Figure 41. There were four higher level borderline cases. All were rated as F.O. either for abstract generalisations (E.C.S. m3; L.C.S.

m11; F.O.S. u5) or awareness of ambiguity (F.O.S. u5). All but one of the subjects (L.C.S. j9) differentiated between recorded and imaginative treatments. It was assumed that the exception was due to lack of decentering for associations. Most lower level subjects differentiated by identifying one treatment: a) copied: (E.C.S. j1, j4, j8, j10, j11; L.C.S. j7; F.O.S. m7, m2);
b) made-up: (E.C.S. j3, j12; L.C.S. j5, m5, m8).

Most higher level subjects compared both treatments ((E.C.S. m3; L.C.S. m1, m4, m6; F.O.S. m9, m11, u1, u2, u3, u4, u6, u7). In addition two subjects were aware of the difficulties differentiating between two treatments (E.C.S. j2; F.O.S. u5).

In general copying was associated with similarities, and made-up with differences by:

- a) associating the subject matter with physical reality (E. C.S. j2, j3, j4, j8; j10, j11, j12; L.C.S. j7, m1, m4, m10, m11, m12; F.O.S. m2, m7, m11, u5);
- b) comparisons with the accuracy of depiction (E.C.S. j1; F.O.S. u1, u4).

Some subjects associated copying with observed drawing and made-up with remembered drawing or painting (L.C.S. j5, m1, m6; F.O.S. u6) Contextual references for copied/made-up were associated with the subject matter (L.C.S. j7, m8, m12; F.O.S. m9) and the artist's birth (F.O.S. u7). There were also examples of: causal (E.C.S. j11; L.C.S. j5, m4; F.O.S. m2, m11), hypothetical (E.C.S. j2, j3, j8, m3; F.O.S. m9, u1, u2, u3, u4, u6) and relative thinking (E.C.S. j2; F.O.S. m11, u5, u7) from each of the samples.

The progression of the ability to differentiate between recorded and imaginative treatments was assessed through:

- a) simple tautological associations with physical reality for differences in the subject matter;
- b) complex associations with physical reality differences in subject matter, techniques and time as length;
- c) theoretical associations with the subject matter, techniques, historical context and relative thinking.

The categories for three operational levels indicated a tripart structure for this ability. However, the projected measure needed to include associations with the subject matter, techniques, the historical context and relative thinking.

6.2.2.4.7. Summary of the Testing of the Tripart Structure of the Abilities to

Analyse the Treatment.

Data analysis indicated all of the treatment abilities could be assessed according to the complexity of the literal and psychological associations with thematic and technical elements. However, there were differences in the kinds of associations, which were assumed to be due to functional and stylistic differences in the artworks. These were:

- a) literal and psychological associations with the subject matter for a realistic treatment and implicit technical associations with drawing.
- b) psychological associations with the subject matter and techniques for emotive treatments;
- c) literal, psychological and technical associations with the formal elements for abstract treatments as problem solving.

6.2.3. The Tripart Structure of the Interpretive Abilities.

Data analysis of the tripartite structure of the interpretive abilities, was separated into the assessment of associations for functional and holistic abilities. Data analysis indicated that the manner of working framework based on thematic and compositional unity could be adapted to assess thematic and technical functions for all of the interpretative abilities. The following broad operational categories for thematic and technical functions, were derived from data analysis of the interpretive abilities.

Tautological Categories: 1. Simple Thematic and Technical Functions.

1i. Decoding the subject matter, formal elements and emotions: simplistic narrative.

1ii. Decoding techniques.

Circumstantial Categories: 2. Complex Thematic and Technical Functions.

2i. Decoding the subject matter/formal elements: implicit- explicit narrative themes or techniques;

2ii. Technical functions or rules: e.g. drawing; stylistic comparisons; technical compositional unity.

2iii. Simple psychological themes: implicit-explicit intentions, emotive states and actions;

2iv. Simple Historical Comparisons.

2v. Non-interpretative Art Functions;

Theoretical Categories: 3. Thematic and Technical Functions.

3i. Narrative thematic generalisations and rules: including inconsistencies;

3ii. Psychological thematic generalisations and rules including inconsistencies;

3iii. Technical Generalisations and rules:

a) style;

b) technical compositional unity;

3iv.. Hypothetical argument.

3v.. Historical generalisations.

6.2.3.1. The Functional Interpretations

The assessment of functional interpretations derived from related concepts was given separately for the Utilitarian and Contextual, Expressive, Formalist functions.

6.2.3.1.1. Data Analysis of Utilitarian/Contextual Functions.

A separate data analysis of the assessment of the three abilities for Utilitarian functions, was followed by a separate data analysis of the two abilities for Contextual functions.

6.2.3.1.1.1. The Ability to Infer Literal Themes.

Data analysis indicated that the ability to infer a literal theme, could be assessed through the complexity of literal and psychological associations. This was because the 'realistic' depiction (Manet, 1881A Appendix V), promoted references to literal and psychological themes. The thematic assessment included an implicit description of what the work was about, and explicit references to stories, themes or issues. Subjects who referred to both implicit and explicit themes, were rated according to the highest level of response. The following pre-specified operational categories for assessment, were derived from data analysis.

Tautological Categories: 1. Simple Thematic Function.

- 1i. Decoding the subject matter: simplistic narrative associated with a specific simple action (*drinking*, E.C.S. j6; *leaning walking, waiting*, L.C.S. j9);
- 1ii. Decoding techniques: no examples.

Circumstantial Categories: 2. Complex Thematic and Technical Function.

2i. Decoding the Subject Matter: Literal Narrative Themes:

a) implicit themes associated with actions as relations between people (*serving*, E.C.S. j2; *changing money, helping each other*, E.C.S. j8; *selling and buying* (E.C. j12).

b) explicit themes associated with the location of a story or theme (*bar, restaurant*, F.O.S. u6), or a literary association for a person (*Cinderella*, E.C.S. j10).

2ii. Technical Function: associating art with drawing (L.C.S. j5);

2iii. Simple Psychological Themes.

a) implicit themes associated with the intention of a person depicted (E.C.S. J3);

b) explicit theme: associating a story with the emotive intentions of a person depicted (F.O.S. u1);

2iv. Historical Comparisons: no examples.

2v. Simple Non-interpretative Functions: no examples.

Theoretical Categories: 3. Thematic Functions.

3i. Narrative Thematic Generalisations and Rules.

a) implicit themes associated with events (*performing*, L.C.S. m6; *entertained*, F.O.S. m2), *an idea* (L.C.S. m12) or *point of view* (F.O.S. m9) about work from the pictorial location; and rules for 'truth to appearance' (L.C.S. m8; F.O.S. m2, m9)

b) explicit themes: associating a story with events (*celebration*, L.C.S. J7; *debate*, F.O.S. m11) and doubt about the pictorial location, in the light of visual evidence (F.O.S. m11).

3ii. Psychological Thematic Generalisations and Rules

a) explicit themes associated with emotive states (F.O.S. u2; u5) and emotive exceptions from the artist's impression (F.O.S. u5); dreaming about the *other side of life* (F.O.S. u7); and thematic rules as atmosphere of place, mood of working (F.O.S. u4) *feeling* (F.O.S. u7) and thematic comparisons of: story/scene (F.O.S. u4).

3iii. Technical Generalisations and Rules: no examples;

3iv. Hypothetical Argument: no examples;

3v. Historical Generalisations: no examples.

The operational categories and responses for the ability to infer literal themes are shown in Appendix XI, Figure 42. There were three borderline higher level cases that were rated as F.O. for implicit use of thematic rules (L.C.S. m8); an abstract generalisation of '*situation*' (F.O.S. u7) and emotions (F.O. S. u7). All but seven subjects (E.C.S. j1, j4, j11, m3; L.C. S. m10; F.O.S. M7, u3) were able to infer an implicit/explicit theme from the subject matter. It was assumed the negative responses for lower level subjects were due to lack of decentering for generalisations and higher level subjects to lack of understanding of the question. Only one subject made an association with the technical function of art as drawing (L.C.S. j5).

Most subjects used implicit descriptions to interpret what the artwork was about, mainly through literal associations with people's actions in place and time (E.C.S j2, , j6, j12; L.C.S. j5, j7 j9, m6, m8. F.O.S. m2, m9, m11). There were also some

psychological associations with people's intentions (E.C.S. j3) the *artist's impression* (F.O.S. u5) *ideas* (L.C.S. m12) *feelings, moods, atmosphere* (F.O.S. u1, u4 u7); Ten subjects made explicit associations with a theme, as a literal (E.C.S j10; L.C.S. j7; m8; F.O.S. m11, u6) or emotive (F.O.S. u1, u2 u5 u7) story/theme and as thematic rules (F.O.S. u4). Therefore, it was assumed that implicit descriptions of what the work was about, required further critical skills to make explicit thematic generalisations.

Data analysis indicated that the complexity of literal associations with the subject matter could be assessed for all modes of reasoning, with the reservation that tautological associations were simplistic. The categories for three operational levels indicated that this ability had a tripart structure. However, the modal measure needed to include psychological interpretations of a theme which could be inferred from spatial associations.

6.2.3.1.1.2. The Ability to Associate Real Space with Narrative Themes.

Data analysis indicated that the ability to associate real space with narrative themes (happenings) could be assessed through the complexity of the spatial associations i.e. items or actions located in space. The following pre-specified categories were derived from data analysis.

Tautological Categories: 1. Simple Thematic Functions.

1i. Decoding the Subject Matter: implicit narrative themes were associated with a specific simple action e.g. *sitting* (L.C.S. j5) *leaning* (L.C.S.. j9) or simple location (*on, by*, L.C.S. j9).

1ii. Techniques: no examples.

Circumstantial Categories: 2. Complex Thematic Functions.

2i. Decoding the Subject Matter: implicit narrative themes associated with:

a) comparisons with reality for simple poses (L.C.S. m1, m12);

- b) actions between people, e.g. *talking* (E.C.S. j2) *about the family* (L.C.S. m4); *serving* (E.C.S. j12); *watching* (E.C.S. m3) *an act* (L.C.S. m5) and *discussion/debate* (F.O.S. m11);
- c) actions in depth as background (E.C.S. j4, j7; F.O.S. m2) or in a place (L.C.S. m10), with depth used to correct the identification of the pictorial location (F.O.S. m11); d) an event: *party* or *ball* associated with the amount of people in a location (F.O.S. u6);
- e) thematic rules for importance (F.O.S. m11) and *talking* (L.C.S. m4);
- 2ii. Simple Psychological Themes. People's intentions within the picture, predicted as social actions in time (E.C.S. j1, j3, j11; L.C.S. m8; F.O.S. u3, u5), and associations of pose and actions with mental states (*wondering*, L.C.S. m8; *thinking* F.O.S. u5; *enjoying* E,C,S j8; F.O.S. u7);
- 2iii. Technical functions and rules: no examples.
- 2iv. Time Comparisons. Thematic time associated with age (L.C.S. m4), and actions (E.C.S. j1, j3, j11, j12; L.C.S. m8 F.O.S. u5);
- 2v. Non-Interpretative Functions: no examples;

Theoretical Categories: 3. Thematic Functions.

- 3i. Narrative Abstract Generalisation and Rules: spatial generalisation of a *reflection* (F.O.S. u1, u2, u4, u7) with a correct spatial reversal of missing information (F.O.S. u6) and generalisations of social functions e.g. *entertainment* (F.O.S. m2) and *celebrating* (L.C.S. m6; F.O.S. m7);
- 3ii. Psychological Abstract Generalisation and Rules: *questioning look on her face* (F.O.S. m9);
- 3iii. Technical Rules: no examples;
- 3iv. Hypothetical argument: for social themes (F.O.S. u7).
- 3v. Historical generalisations: no examples.

The operational categories and responses for the ability to associate real space with narrative themes are shown in Appendix XI, Figure .43 There were two lower level borderline cases (E.C. S. j3, m3), which were rated as L.C.O. for references to relations between people. All but one of the subjects (E.C.S. j10), were able to associate narrative themes with real space. It was assumed that the negative response was due to lack of decentering for comparisons with reality. Most subjects associated happenings with real space through a narrative description of the pose, constituent relations or actions in time depth or place (E.C.S. j4, j6, j12, m3; L.C.S. j5, j7, j9, m1, m4, m8, m10, m12;) F.O.S. m2, m11, u3).

There were also some spatial generalisations (*reflection*, F.O.S. u1, u2, u4, u7) and an abstract spatial reversal (F.O.S. u6). Four subjects generalised the relations of people in space into an event: e.g. *celebrating* (L.C.S. m6, F.O.S. m7), *party or ball* (L.C.S. m10) party (F.O.S. u3), *circus, entertainment* (F.O.S. m2). However, some spatial generalisations were psychological e.g. *celebrating, entertainment*. Similarly, associations with intentions or preferences based on actions were regarded as spatial, (E.C.S. j1, j3, j11; L.C.S. m8; F.O.S. u5, u7) but if used with named mental states were rated as psychological. There were also several hypothetical spatial associations for this ability (E.C.S. j2, j8, j11; L.C.S. m4, m6, m8; F.O.S. m11, u1, u3, u5, u7). The categories for three operational levels indicated that this ability had a tripart structure, although tautological modes were simplistic. In addition the modal measure needed to include psychological associations that were inferred from spatial cues.

6.2.3.1.1.3. The Ability to Infer the Life Imitated.

Data analysis indicated that the ability to identify the life imitated for social (Hogarth, 1743 Appendix V) and political (Manet, 1867B Appendix V) themes, could be assessed according to the complexity of the literal and psychological associations. The following pre-specified operational categories were derived from data analysis of inferences for the social and political life imitated.

Tautological Categories: 1. Simple Thematic Functions.

1i. Decoding the Subject Matter: simplistic themes.

A) Social: life associated with specific simple moods of people (*happy, sad*, E.C.S. j2);

B) Political: life associated with simple actions (*shooting*, E.C.S. j12; L.C.S. j5, j9; length of life and killing, E.C.S. j11); shooting also associated with simple emotive states (E.C.S. j6, j10).

1iii. Techniques: no examples.

Circumstantial Categories: 2. Complex Thematic and Technical Functions.

2i. Decoding the Subject Matter: implicit/explicit narrative themes.

A) **Social**: life associated with items, actions for objects and people (E.C.S j4, j12: L.C.S. j5) located in depth (E.C. S. j4; L.C.S. j5) and physical generalisations of actions and places (*fight in a stately home*, j7);

B) **Political**: life associated with differences between people (E.C.S. j3), and explicit references to themes as *war*, from items and actions (E.C.S. j4) or the location of an actual event (F.O.S. u2), and a thematic explanation for people being killed (F.O.S. u6).⁹

2ii. Psychological Themes.

A) **Social**: life associated with simple dispositions (*kind*, E.C.S. j6; *lazy*, E.C.S. j10; L.C.S. m4; *laid back* (L.C.S. m6; *nasty sides*, F.O.S. u2) or states (*tough*, E.C.S. j8 *tired*, *lazing around*, L.C.S. m5; *rich*, L.C.S. m6, m12; *relaxing*, *bothered*, L.C.S. m8; *enjoy*, F.O.S. m7; *bored*, F.O.S. m9) by decoding items, their location and actions. Dispositions and states were also explicitly related to themes as: a *party* (L.C.S. m4, m8), *laziness* (L.C.S. m4), *a fight* (L.C.S. m6), *rich living* (L.C.S. m12) *possessions* (L.C.S. m7) and motives for *wrong doing* (F.O.S. m9).

B) **Political**: actions in life associated with dispositions (E.C.S. j1) or states (E.C.S. j8, m3) and *wrong doing* (L.C.S. m10). There were explicit references to themes of: cruelty (F.O.S. u3), *wrong doing* (F.O.S. u3), and *life in some countries* related to social control (L.C.S. m11).

2iii. Technical Rules: imitating life.

A) **Social**: rich associated with the detail of the house (L.C.S. m6);

B) **Political**: no examples.

2iv. Time comparisons.

A) **Social**: the past as age, associated with items, actions, places (E.C.S. j8; L.C.S. j9) unknown items (E.C.S. j3) or life styles (L.C.S. m12). Thematic time associated with *the end of the day* (F.O.S. u11);

B) **Political**: the past as age, associated with civil actions, and the present with items in current use (L.C.S. m5).

2v. Non-interpretative functions: no examples.

Theoretical categories: 3. Thematic Functions.

3i. Narrative Thematic Generalisations and Rules.

A) **Social**: an explicit reference to a theme as a story of a *particular* household (F.O.S. u6), and thematic rules for imitating life: *perfect* (L.C.S. m1), *everyday scene* (F. O.S. m2), *normal* (F.O.S. u1) and the relativity of life (L.C.S. m1; F.O.S. u4).

B) **Political**: the identification of spatial inconsistencies (L.C.S. m4); the generalisation of events (*executing*) for implicit (E.C.S. j2) and explicit themes (F.O.S. m9) .

3ii. Psychological Thematic Generalisations and Rules.

A) **Social**: abstract generalisation of relations between people as conversation (F.O.S. u5, u6) and explicit references to themes as: changing moods and retrospection (F.O.S. m11); *individualism* (F.O.S. u5); upper class attitudes (F.O.S. u7). Thematic rules of: *perfect* (F.O.S m11), *lively* (F.O.S. u5), *ordinary* social organisation (F.O. S. u7) and a critical evaluation of life styles (E.C.S. m3).

B) Political: abstract generalisations of *illegal* (L.C.S. m1), *punishment* (F.O.S. u7), *injustice* and *lifestyles* (F.O.S. m11), *nationality* (L.C.S. m7), *beliefs* (L.C.S. m6), *capabilities* (F.O.S. u2), and emotive states (L.C.S. m9; F.O.S. u5). There were references to explicit themes as retribution (F.O.S. m11) reasons for punishment (F.O.S. u7), retrospective human rights (F.O.S. M7), an execution issue (F.O.S. u5), and a particular event in history (F.O.S. u4) which was also a thematic rule. There were other thematic rules for social relations (L.C.S. m8), prejudice (F.O.S. m7) and for past and present attitudes (F.O.S. u5).

3iii. Technical Generalisations and Rules.

A) Social: no examples.

B) Political: technical rules for a *dramatic picture* (F.O.S. u5).

6iv. Hypothetical argument: no examples.

6v. Historical generalisations.

A) Social: no examples.

B) Political: of a *particular* event (F.O.S. u4) by name (L.C.S. j7).

The operational categories and responses for the ability to infer the life imitated, are shown separately in Appendix XI, for social (Figure 44.) and political (Figure 45.) themes. In addition subjects were rated for descriptions of the life imitated or references to explicit themes. References to both were combined in the figures and rated according to the highest level of response. The responses for social and political themes were described separately, but followed by a combined comparison of the literal and psychological associations.

6.2.3.1.1.3.1. Social Themes.

In relation to social themes, there were two lower level borderline cases, which were rated at L.C.O. for referring to complex items (E.C.S. j12) and possibilities (E.C.S. j6). There were three higher level borderline cases, that were rated at F.O. for abstract generalisations (F.O.S. m2, u5, u7). All but one of the subjects (E.C.S. j1), were able to infer the life imitated. It was assumed that the negative response was due to lack of decentering for associations with the subject matter. Fourteen subjects made literal associations with the subject matter. This included: a

narrative description of items located as actions or depth, for the time of day and the historical context (E.C.S. j3 , j4, j8, j12; L.C.S. j5), j7 j9, m10, m12) F.O.S. u1); an abstract generalisation of a *particular* household (F.O.S. u4), and thematic rules for imitating life (L.C.S. m1; F.O.S. m2, u4). Sixteen subjects made psychological associations with the subject matter. These included associations with dispositions, mental states (E.C.S. j2, j6, j8, j10; L.C.S. m4, m5, m6, m8, m12; F.O.S. m2, m7, m9, m11, u5, u7), and thematic rules for imitating and evaluating life (E.C.S. m3; F.O.S. m11, u5, u7). There was one reference to a technical rule (L.C.S. m6) for imitating life. There were also references to compositional order, which were implicit in thematic references to the location of items (E.C.S. j6, j11; L.C.S. m6, m8; F.O.S. m2, u7).

6.2.3.1.1.3.2. Political Themes.

In relation to political themes there was one borderline higher level case, which was rated as F.O. for using an abstract generalisation. (F.O.S. u7). All of the subjects were able to infer the life imitated for a political theme. Fifteen subjects made literal associations with people and/or actions (E.C.S. j4, j11, j12; L.C.S. j5, j9; F.O.S. m9), unknown reasons for actions (F.O.S. u6) generalisations of actions as war (E.C.S. j3; F.O.S. u2) executions (E.C.S. j2; F.O.S. m8, u5), and the identification of spatial inconsistencies (L.C.S. m4). Actions were related to the historical context through events (L.C.S. j7, m5, F.O.S. u2); Nineteen subjects made psychological associations. These included: a) specific dispositions, states, capabilities, moral abstractions (E.C. S. j1, j2, j8; F.O.S. m2, m11, u4, u5);. b) actions (*shooting, killing, watching*) associated with psychological concepts

(E.C.S. *kind*, j6; *bad*, j10; *rich* m3; L.C.S. *illegal* m1; *wrong doing* m10, social control, m12; F.O.S. *cruel* m2; injustice, m11; *wrong doing* u1; *belief*, u6; *punishment*, u7), and explicit themes as: *life in other countries* (L.C.S. m12), retribution (F.O.S. m11), *wrong doing* (F.O.S. u1), *cruelty* (F.O.S. u3) and reasons for punishment (F.O.S. u7). Historical events were also related to human rights (F.O.S. m7), and murder F.O.S. u4). c) thematic rules for: social relations (L.C.S. m8); past and present rules for attitudes (F.O.S. u5), and prejudice (F.O.S. u7). There was also one association with technical rules for the depiction of a *dramatic picture* (F.O.S. u5).

The associations for social and political themes were mainly literal and psychological with few references to technical associations, which was assumed to be due to the interpretive focus on the subject matter. In addition, associations for social themes were circumstantial and theoretical, whereas political associations were made for all three modes of thinking. It was assumed that difficulties in understanding the subject matter accounted for these modal differences. Similarly, difficulties in understanding abstract concept was assumed to account for the lack of explicit thematic generalisations for all but one of the E.C.S. (j3, *war* for a political theme) and the following subjects from the two higher level samples (Social themes: L.C.S. m4, m6, m8, m12; F.O.S. m7, m9, m11, u1, u4, u5, u6, u7. Political themes: L.C.S. m12; F.O.S. m9, m11, u1, u2, u3, u4, u5, u6, u7).

The ability to infer the life imitated was assumed to have a tripart structure, based on the presence of categories for three operational levels for political themes.

However, the modal measure needed to take into account the level of difficulty of the subject matter and include psychological associations. The assessment of the two contextual abilities to infer a social theme/message and relate the contents to contemporary events or theories, was assessed through the responses for the ability to infer the life imitated.

6.2.3.1.1.4. The Ability to Infer a Social Theme/Message.

The assessment of the ability to infer a social theme/message corresponded with the assessment of social and political themes, as previously described and shown in Appendix XI, Figures 44, 45. Therefore the operational structure was also assumed to be tripartite, with the reservation that the following responses were simplistic: Social themes: E.C.S. j3, j4, j5; L.C.S, j5. Political themes: L.C.S. j5, j9.

6.2.3.1.1.5. The Ability to Relate the Contents to Contemporary Events or Theories.

Data analysis indicated that the ability to relate the contents to contemporary events and theories, could be assessed according to the complexity of the associations with time. The following operational categories and responses were derived from the associations with time from the social and political themes (Appendix XI, Figures 44; 45).

Circumstantial Categories:

1. Simple time comparisons relating:

a) events to the historical context,

b) life-styles to the historical context

through items, actions or places (E.C.S j3, j8;, L.C.S. j9,. m4, m5, m12)

Theoretical Categories

2. Historical generalisations for contextual associations with:

- a) named historical events (L.C.S. j7), and a thematic rule i.e. a particular event in history (F.O.S. U 4);
- b) theories as retrospective comparisons of human rights (L. C.S. m7) and issues (F.O.S. u5).

The operational categories and responses for the ability to relate the contents to contemporary events and theories are shown in the Appendix XI, Figure 46. The complexity of time associations for events was assessed through circumstantial and theoretical modes, whereas theories were assessed through theoretical modes only. Therefore the operational structure for events was assumed to be tripartite and for theories mono. The projected modal measure also needed to include lifestyles for this ability. However, the lack of a question to focus on contextual associations resulted in few contextual responses. Therefore, there was no rating of this ability.

6.2.3.1.1.6. Summary of the Testing of the Tripart Structure of the Abilities for Interpreting Utilitarian and Contextual Functions.

Data analysis indicated that all of the Utilitarian and Contextual interpretive abilities focused on thematic unity. This could be assessed through the complexity of the literal, psychological and to a lesser extent time associations. In addition psychological associations played an important role in the interpretation of meaning. However, a distinction was required between descriptions of meaning and explicit references to themes, for assessment purposes. There were few references to technical functions, which tended to remain implicit in the description of the subject matter. The historical context could be accessed through

events and to a lesser extent more complex associations with contemporary or retrospective theories.

6.2.3.1.2. The Abilities to Interpret Emotive Functions.

The three abilities to interpret emotive functions as moods and feelings, were assessed according to the complexity of the emotive associations. Data analysis of the assessment of the ability to infer the emotions communicated was derived from a combined rating of the assessment of the abilities to make emotive associations with the subject matter and the techniques (Appendix VII).

6.2.3.1.2.1. The Ability to Infer an Emotive Theme from the Subject Matter.

Data analysis indicated that the ability to infer an emotive theme from a literal artwork (Bellini. 1460 Appendix V) could be assessed through the complexity of the emotive associations with the subject matter. The following pre-specified operational categories were derived from data analysis.

Tautological Categories 1. Simple Thematic Functions:

- 1i. implicit associations with emotive states from the subject matter (E.C.S. j1, j2, j8, j10; L.C.S. m9, m5) or a subjective associations with harmful actions (L.C.S. j5);
- 1ii. Techniques-emotions: no examples.

Circumstantial Categories: 2. Complex Thematic Functions.

- 2i. Narrative decoding of the subject matter: vacuous.
- 2ii. Psychological associations with emotive states (L.C.S. j7, m1; F.O.S. u2, u3) or emotive actions (E.C.S. j6, j11) or an emotive Biblical story (E.C.S. m3; L.C.S. m4, m8, m12; F.O.S. m2);
- 2iii. Technical functions and rules: an association with thematic rules (L.C.S. m7).
- 2iv. Time comparisons: thematic time as *minutes* (L.C.S. m12);

Theoretical Categories: 3. Thematic/Technical Functions.

- 3i. Narrative themes: not applicable.
- 3ii. Psychological thematic generalisations and rules: associations with emotive states (L.C.S. m6, m9; F.O.S. u1, u4 u5, u6) or actions (L.C.S. m10, m11).

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levels indicated that ability had a tripart structure. However, interpretations were accepted as simple naming of emotive states and emotive relations.

6.1.3.2.1.2. The Ability to Infer Emotions from the Techniques.

Data analysis indicated that the ability to infer emotions from the emotive treatment (Matisse, 1905 Appendix V), could be assessed according to the complexity of the associations with the subject matter and techniques. The following pre-specified operational categories were derived from data analysis.

Tautological Categories: 1. Simple thematic-technical functions.

- 1i. implicit associations with emotive states from the subject matter (E.C.S. j1, j8 ; L.C.S. m9; F.O.S. u2);
- 1ii. Techniques associated with the artist's preference (E.C.S. *nice* j3).

Circumstantial Categories: 2. Complex thematic-technical functions.

- 2i. Narrative decoding of the subject matter: vacuous.
- 2ii. Psychological thematic associations with
 - a) named emotive states (E.C.S. j11, m3; L.C.S. j5, m1; F.O.S. u3);
 - b) ranking (E.C.S. j2) and comparing (F.O.S. u3) emotions;
 - c) people (pose, facial expression: F.O.S. m2, m9, m11 u1, u3, u5, u6); or projected emotions from the facial features (L.C.S. m5) and actions (L.C.S. m2).
- 2iii. Technical rules associating emotions with the use of colour (L.C.S. m4, m12; F.O.S. m7, m11);
- 2iv. Time comparisons: no examples.

Theoretical Categories: 3. Thematic - Technical Functions.

- 3i. Narrative themes: not applicable.
- 3ii. Psychological thematic generalisations were associated with implicit named emotive states (L.C.S. m10) and mental states associated with observed actions (L.C.S. m6). Thematic rules were associated with the depiction of emotion (F.O.S. u4).
- 3iii. Technical generalisations were associated with the style of painting, and rules for emotive use of colour (F.O.S. u7).
- 3iv. Hypothetical argument: no examples.
- 3v. Historical generalisations: no examples.

The operational categories and responses for the ability to infer emotions from an emotive treatment are shown in Appendix XI, Figure 48. There was one borderline

lower level case (E.C.S. j8), which was rated at E.C.O. for repeating the question. There was one borderline higher level case (F.O. S. u4) which was rated as F.O. for use of a simple theoretical rule. All but five subjects were able to make emotive associations. It was assumed that the four negative responses (E.C.S. j4, j6, j10; L.C.S. j7) and one vacuous response (E.C.S. *paints*, j12), were due to an inability to make empathic associations. Most subjects referred to simple (E.C.S. j1, j8; L.C.S. m9; F.O.S. u2) complex (E.C.S. j2, j11, m3; L.C.S. j5, m1) and abstract (L.C.S. m10) emotive states. Six subjects made emotive associations with the subject matter (E.C.S. m5, m6, m8; F.O.S. m2, m9, u1). Seven subjects made emotive associations with techniques for use of colour (j3 m4, m12, m7, m11) colour preference (E.C.S. j3) and the style of painting (F.O.S. u7).

The categories for three operational levels indicated that this ability had a tripart structure. However, emotive associations that were derived from the subject matter and techniques required different assessment procedures.

6.2.3.1.2.3. Summary of the Testing of the Tripart Structure of the of the Abilities for Interpreting Emotive Functions.

Data analysis indicated that emotive themes as naming emotive states could be inferred at all levels of development. However, explicit emotive associations required higher levels of development. Emotive associations with the subject matter and techniques involved different assessment procedures. Emotive associations included:

a) implicit emotive states;

- b) explicit spatial associations with the subject matter;
- c) spatial associations with techniques and rules;
- d) emotive abstract generalisations and rules.

6.2.3.1.3. The Interpretive Abilities for Formalist Functions.

Data analysis indicated that the pre-specified operational categories for interpretation, provided a means of co-ordinating the assessment of thematic and technical compositional unity for formalist functions. However, the methodologies for assessing the tripart structure of the ability to infer analogous themes and the three abilities to infer a united technical composition were different. Separate descriptions were given of the assessment procedures for each ability.

6.2.3.1.3.1. The Ability to Infer Analogous Themes from the Formal Elements.

Data analysis indicated that the ability to infer analogous themes, could be assessed through the complexity of literal, psychological and technical associations with the formal elements. However, the data being analysed was derived from the responses for the ability to decode abstract qualities (Appendix XI, Figure 22). These responses were re-classified into the following pre-specified operational categories for thematic and technical functions.

Tautological Categories: 1. Simple Thematic/Technical Functions.

- 1i. an analogous decoding of the formal elements by naming emotive states (F.O.S. u3);
- 1ii. technical use of colour as a simple analogy for style (E.C.S. j1).

Circumstantial Categories 2. Complex Thematic /Technical Functions.

- 2i. Narrative themes from literal analogous associations with actions and items (E.C.S. j2, j3, j11; L.C.S. m5; F.O.S. u7).

2ii. Psychological themes from technical-emotive associations (L.C.S. m6; F.O.S. m7);
 2iii. Technical functions and rules were associated with the artist's feelings (L.C.S. m6) people's feelings (F.O.S. m7) and style from the colour (L.C.S. j9).
 2iv. Time comparisons: no examples.
 Theoretical Categories: 3. Thematic/Technical Functions.

3i. Narrative rules associated formal elements with a representation of real life (F.O.S. u5);
 3ii. Psychological themes associated colour with mood (F.O.S. m9) and rules for emotive depiction's (F.O.S. u5);
 3iii. Technical generalisations and rules: no examples;
 3iv. Hypothetical comparison of literal and emotive art functions (F.O.S. u5). 3v. Historical generalisations: no examples.

The operational categories and responses for inferring analogous themes are shown in Appendix XI, Figure 49. There was one borderline case (E.C.S. j3), which was regarded as an implicit interpretation. All of the responses were given an operational level to determine the tripart structure. However, the responses were not rated because the sample of seventeen subjects was unrepresentative. All but one of the subjects (E.C.S. j10) made analogous associations with themes. It was assumed that the vacuous response (E.C.S. j10) was due to lack of decentering for empathic or literal analogous associations.

All of the literal analogies required an higher level association between formal elements and items or actions (E.C.S. j2, j3, j11; L.C.S. m4; F.O.S. u7). However, emotive technical analogies that involved naming emotive states and colour associations were possible at tautological (F.O.S. u3; E.C.S. j1) and circumstantial levels (L. C.S. j9, m6; F.O.S. m7). Therefore, it was assumed that different kinds of analogies were made with the subject matter and techniques which developed at different levels i.e. analogous associations with the subject matter would have a bipart structure and analogous associations with the techniques would have a

tripart structure. In addition, the modal measure needed to include simple emotive states, psychological and technical decoding for analogous themes, and reclassify analogies with the subject matter as circumstantial.

6.2.3.1.3.2. The Ability to Infer (Technical) Compositional Unity.

The ability to infer compositional unity involved a separate assessment of the abilities to infer a solution to a design problem and to infer the pleasing qualities.

6.2.3.1.3.2.1. The Ability to Infer the Solution to a Design Problem.

Data analysis indicated that the ability to infer the solution to a design problem as the production of an interesting composition, could be assessed according to the complexity of the technical associations. However, associations with expressive designs included literal and psychological thematic associations. The following pre-specified categories were derived from data analysis of responses for geometric abstraction (Mondrian, 1920 Appendix V) and expressive abstraction (Kandinsky, 1913 Appendix V).

Tautological Categories: 1. Simple Technical Functions.

1i. Decoding Formal Elements for Compositional Interest:

A) **Geometric:** was associated with named formal elements: line, shape, colour (E.C.S. j4, j6).

B) **Expressive:** was associated with *colour* (E.C.S. j6, j12) *brightness* (E.C.S. j4) the number of lines (E.C.S. j3) and media (E.C.S. j12).

1ii. Technical Interest:

A) **Geometric:** was associated with the use of formal elements (E.C.S. j1; L.C.S. j5), the artist's preference for pattern (E.C.S. j3) and implicit colour variety (L.C.S. m5).

B) **Expressive:** was associated with the use of shapes, number of colours (E.C.S. j3) and implicit colour variety (E.C.S. j10).

Circumstantial Categories: 2. Complex Thematic/Technical Functions.

2i. Decoding a Narrative Theme.

A) **Geometric:** thematic interest associated with implicit structural variety (*different rooms* L.C.S. j7).

B) Expressive: thematic interest associated with a literal *picture inside* (E.C.S. j11); *animals, freckles, a mask* (E. C.S. j8); *bird animals a mask* (E.C.S. m3); *monkey's head* (L.C.S. m4); comprehension of items or actions (L.C.S. j5, m1, m5, m6). and rules for *detail* (L.C.S. m4);

2ii. Psychological themes:

A) Geometric: no examples.

B) Expressive: thematic interest associated with subjective emotions (E.C.S. j11).

2iii. Technical Functions and Rules: Interesting Composition:

A) Geometric: associated with:

a) implicit variety of: tone, colour, shape, size or structure (E.C.S. j8, j10, m3; L.C.S. j5, j9, m1, m10, m12) and limited variety as amount of colour (F.O.S. m7), as well as *not interesting*, despite knowledge of implicit variety (F.O.S. m2, u6):

b) implicit unity as technical care (E.C.S. j2, j8) shape and colour dominance (L.C.S. m4) and structural unity of design (E.C.S. j10, j11; L.C.S. m4, m12).

B) Expressive: associated with: a) implicit variety of line, colour or shape (E.C.S. j1, j8, m3; L.C.S. m1, m5; F.O.S. u3);

b) implicit unity as: technical care (E.C.S. j2), colour technique (j1), structured coloured pattern (L.C.S. j7, j9), dominance (L.C. S. m6) with colour novelty (F.O.S. u2);

c) a mixed reference to implicit colour variety and structural unity (L.C.S. m11);

d) emotive use of colour F.O. S. u2).

2iv. Time Comparisons: no examples.

Theoretical Categories: 3. Thematic/Technical Functions.

3i. Narrative Thematic Generalisations and Rules.

A) Geometric: no examples.

B) Expressive: thematic interest associated with *chaos* and comprehension of items (F.O.S. u7) after repeated viewing (F.O.S. u5).

3ii. Psychological Thematic Generalisation and Rules: no examples.

3iii. Technical Generalisations and Rules: Compositional Interest:

A) Geometric: associated with:

a) explicit variety of size and colour (L.C.S. m9) and contrast rules (L.C.S. m8);

b) unity as *random* order (F.O.S. u2), regularity of shapes and colour scheme (F.O.S. u5) structural design and tonal gradation (F.O.S. u3);

c) implicit colour balance associated with psychological *attraction* (F.O.S. u1); d) mixed references to unity as order with implicit colour variety (L.C.S. m6), including dominance (F.O.S. u3); explicit limited colour variety with implicit contrast and order (L.C.S. m1);

B) Expressive: associated with mixed references to: structural unity as random order with colour variety (L.C.S. m8, m10, m12); unity of a novel design with implicit variety of formal elements (F.O.S. m2); explicit variety of formal elements with unity of colour technique (F.O.S. u4); unity (random order/colour technique/dominance) with implicit variety of items (F.O.S. u7).

e) a *modern style* (L.C.S. m1)

3iv. Hypothetical Argument: Formal Interest.

A) Geometric: formal interest associated with structure and meaning (F.O.S. u7).

B) Expressive: no examples.

4v. Historical Generalisations: no examples.

The operational categories and responses for the ability to infer the solution to a design problem, are shown in separate categories for geometric abstraction (Figure 50) and expressive abstraction (Figure 51) in Appendix XI. Separate operational ratings were made for each abstraction.

In relation to geometric abstraction there were two lower level borderline cases, which were rated at E.C.O. for references to the artist's preference (E.C.S. j3) and simple geometric shapes (L.C.S. j5). There were three higher level borderline cases, which were rated at F.O. for identifying metacognitive criteria (*contrast*, L.C.S. m8), a stylistic reference (L.C.S. m1 *modern*) and a structural generalisation (F.O.S. u2). All subjects were able to identify the solution to a design problem, mainly as an interesting technical composition. Most subjects associated technical interest with:

- a) the formal elements (E.C.S. j4, j6; L.C.S. j5), and the artist's preference (E.C.S. j1, j3, j11; L.C.S. m5);
- b) complex variety (differences) and unity (care, technique, novelty, dominance) (E.C.S. j2, j8, j10, j12, m3; L.C.S. j5, j9, m4, m10, m12; F.O.S. m7);
- c) abstract generalisations of variety and structural unity as random order, united design, tonal gradation, dominance, implicit balance and attraction (L.C.S. m1, m6, m8; F.O.S. m9, u3, u4, u5, u6).

There was one stylistic association (L.C.S. m1) and a formal argument relating formal interest to structure and meaning (F.O.S. u7). There were two subjects who considered the composition *not interesting*, despite implicit knowledge of variety

(F.O.S. m2, u6). These responses were assumed to be due to a preference for thematic unity. There was only one literal association of formal elements with *different rooms* (L.C.S. j7), which could be regarded as implicit variety.

In relation to expressive abstraction there were four borderline higher level cases, that were rated as F.O. for generalisations of the structure (L.C.S. m10, m12; F.O.S. m2, u6). All of the subjects were able to infer the solution to a design problem as the production of an interesting theme or technical composition. Most subjects associated interest with the technical composition through:

- a) the formal elements (E.C.S. j4, j6, j11), their use and implicit colour variety (E.C.S. j3, j10; F.O.S. u3);
- b) complex variety of formal elements (differences) and technical unity (novel colour, care, technique and dominance) (E.C.S. j1, j2, j8, m3; L.C.S. j7, j9, m1, m5, m6; F.O.S. m11, u2);
- c) abstract associations with variety and unity (novel structure, random order) (L.C.S. m8, m10, m12; F.O.S. m2, u4, u7).

There was one disagreement on the grounds of dullness, despite knowledge of implicit variety (F.O.S. m7).

There were nine literal associations for thematic interest. Formal elements were associated with a *picture inside* (E.C.S. j11), specific items (E.C.S. j8. m3; L.C.S. m4) and rules for comprehension of items and actions (L.C.S. j5, m1, m5, m6; F.O.S. u5) and *detail* (L.C.S. m4). There were four psychological associations

with subjective emotions (E.C.S. j11); *colour* (F.O.S. u1); *an arrangement* (F.O.S. m2) and *movement* (F.O.S. u6).

In both cases the majority of responses for compositional interest focused on variety and unity. The abstract expressionist design promoted a greater number of thematic associations (nine literal and two psychological), than the geometric design (one literal). This was assumed to be due to the greater possibility of analogous thematic associations with an expressive artwork. The two sets of categories for three operational levels derived from data analysis of abstract and expressive designs, indicated that this ability had a tripart structure. However, the modal measure needed to include simple associations with formal elements and thematic associations.

6.2.3.1.3.2.2. The Ability to Infer the Production of Pleasing Qualities.

Data analysis indicated that the ability to infer the production of pleasing qualities, could be assessed according to the complexity of the technical associations or the method of ranking preferences. The following pre-specified categories were used to assess the ability to infer pleasing qualities as a means of selecting a Utilitarian, Expressive or Formalist artwork.

Tautological Categories : 1. Simple Technical Functions.

1i. Decoding Formal Elements: pleasing qualities associated with: *colour* (E.C.S. j2, j4, j6, j8, j10; L.C.S. j7; j9) and *pattern* (E.C.S. j12) preferred to *lines* (E. C.S. j3).

1ii. Techniques: implicitly associated with references to formal elements above;

1iii. Simple Ranking: pre-ranking as assertions (E.C.S. j1; F.O.S. m7); global fusion as *all good/same/liked* (E.C.S. j2; L.C.S. j5, j7) and ranking by preferences (F.O.S. u3) or *more/less* which repeated the question (E.C.S. j3, j4, j6, j8, j10, j12; L.C.S. j9; F.O.S. m9, u7).

Circumstantial Categories: 2. Complex Technical Functions.

- 2i. Narrative themes: no examples;
- 2ii. Psychological themes: no examples.
- 2iii. Technical rules for pleasing qualities used psychological associations with interest: as formal interest (L.C.S. m5, m10) or thematic interest (E.C.S. j1; (L.C.S. m1, m12) and formal emotive states (L.C.S. m12; F.O.S. u1) or for dislike of formal artworks (L.C.S. m12; F.O.S. u6);
- 2iv. complex Ranking: complex preferences (F.O.S. m2, u5) the most preferred (L.C.S. m8; F.O.S. m11) comparisons of formalist and realistic artworks (L.C.S. m5, m6, m12; F.O.S. u2, u4) ranking with exceptions (F.O.S. u4) and ranking of all six artworks (E.C.S. m3).

The operational categories and responses for the ability to infer the production of pleasing qualities are shown in Appendix XI, in Figure 52. All subjects could make preference judgements. However, only seventeen subjects (E.C. S j2, j3, j4, j6, j8, j10, j11, j12; L.C.S. j7, j9, m1, m5, m10, m12; F.O.S. m9, u1, u6) made explicit associations with pleasing qualities. Therefore, there were insufficient responses to rate this ability. The lack of explicit associations were assumed to be due to the focus of higher level subjects on ranking procedures, rather than pleasing qualities.

Four subjects made associations with pleasing thematic qualities. These included two literal associations with detail and comprehension of items (L.C.S. m12; F.O.S. u6) and two psychological associations with emotive states (L.C.S. m12; F.O.S. u1). Fifteen subjects made associations with pleasing technical qualities through:

- a) colour and pattern (E.C.S. j2, j3, j4, j6, j8, j10, j12 L.C.S. j7, j9, m1, m9, m10) for realistic and formal artworks;
- b) psychological associations with formal interest (E.C.S. j11; L.C.S. m5, m10).

The categories for two operational levels derived from data analysis indicated that the ability to infer pleasing qualities, had a lower-level bipart structure. However,

the multi-functional assessment of pleasing qualities need to include thematic and formal/technical unity along with literal and psychological associations.

6.2.3.1.3.3. Summary of the Testing of the Tripart Structure of Interpretive Abilities for Formalist Functions.

Data analysis indicated that associations were made with thematic and technical unity from formalist artworks which could be assessed according to the complexity of the literal, psychological and technical associations. However, analogous literal and psychological associations with the formal elements and techniques were required to interpret Utilitarian and Expressive themes. Technical unity was also derived from a technical analysis of the formal elements and techniques. In addition problem solving provided a more effective means of assessing compositional unity, than pleasing qualities which focused mainly on colour.

6.2.3.2.. Data Analysis of the Holistic Interpretive Abilities.

Data analysis of the tripartite structure of the holistic interpretative abilities, included four thematic abilities and one reflective ability. The four thematic abilities were paired for assessment purposes. The thematic abilities required a multi-functional assessment of the subjects random selection of one of six artworks that represented the following art functions:

a) Hogarth (1743 Appendix V) or Manet (1967B Appendix V) for Utilitarian functions;

- b) Bellini (1460 Appendix V) or Matisse (1905 Appendix V) for Expressive functions;
- c) Mondrian (1920 Appendix V) or Kandinsky (1913 Appendix V) for Formalist functions.

The reflective ability to revise interpretations in the light of the visual evidence was assessed separately. Data analysis indicated that the pre-specified operational categories for assessing thematic and technical functions could be used to assess all of the holistic abilities.

6.2.3.2.1. The Abilities to Select and Make a Functional Interpretation and Identify a Theme.

The assessment of these two abilities was combined because it was assumed that functional interpretations would be for thematic rather than technical compositional unity. These abilities were assessed through an explanation of what the artwork was about, according to the complexity of the literal and psychological associations. Unsupported selections did not identify a theme and were rated as a no response. Data analysis indicated that all subjects were able to make a preferred selection of an artwork as shown in Figure 27. The majority of subjects (seventeen) preferred Kandinsky's artwork. However, six subjects from the two lower level samples were unable to give reasons for Hogarth (E.C.S. j1, j4) and Kandinsky's artwork (E.C.S. j6, j10, j12; L.C.S. m1). It was assumed that lack of comprehension of the subject matter or style accounted for negative responses. There was evidence that informational support increased with

operational maturation i.e. E.C.S. 5 examples; L.C.S. 8 examples; F.O. S. 11 examples.

FIGURE 27

THE SELECTION OF ONE OF SIX ART WORKS BY THREE OPERATIONAL SAMPLES.

Artwork Selected.	Operational Sample			Total Selected
	ECS	LCS	FOS.	
Utilitarian				9
1. Hogarth	j1 j4	m8 m10	m2 u1, u6	
2. Manet		j7	u2	
.....				
Expressive				5
3. Bellini	j8 m3	j5		
4. Matisse'		m12	u4	
.....				
Formalist				17
5. Mondrian			u7	
6. Kandinsky	j2 j3 j6 j11 j12	j9 m1 m4 m6	m7 m9 m11 u5	
.....				

The following pre-specified operational categories for assessing the ability to identify themes were derived from data analysis.

- Tautological Categories 1. Simple Thematic and Technical Functions.
- 1i. Thematic associations by naming simple emotive states from the formal elements (Kandinsky: F.O.S. u3);
 - 1ii. Techniques: no examples;
 - 1iii. Physical cause for subjective emotions, (Bellini: L.C.S. j5): b)

- Circumstantial Categories: 2. Complex Thematic and Technical Functions.
- 2i. Literal themes associated with the subject matter (Hogarth: F.O.S. u1) and analogously with the formal elements (Mondrian: F.O.S. u7; Kandinsky: E.C.S. j2, j3, j11; L.C.S. m4, m5);
 - 2ii Psychological themes associated the subject matter with
 - a) thematic intentions (Hogarth: L.C.S. m8, F.O.S. m2, u6);
 - b) emotive relations between people or their feelings (Bellini: E.C.S. j8, m3);

- 2iii. Technical Functions were associated with the *portrait* genre (Matisse: L.C.S. m12) and the artist's emotive intention (Matisse L.C.S. m6, m9) or emotive associations with colour (Kandinsky: F.O.S. u7);
- 2iv. Time comparisons identified the theme through the psychological location (Hogarth: L.C.S. m10).

Theoretical Categories 3. Thematic and Technical Unity.

- 3i. Literal thematic generalisations and rules: no examples;
- 3ii. Psychological thematic rules associated with the artist's viewpoint (Matisse: F.O.S. u4) and literal-expressive themes (Kandinsky's F.O.S. u5);
- 3iii. Technical rules for the emotive construction of artworks (Bellini/Kandinsky: L.C.S. m11);
- 3iv. Hypothetical argument: no examples.
- 3v. Historical generalisation of actions (Manet: L.C.S. j7) and nationality (Manet: F.O.S. u2).

The operational categories and responses for the ability to identify a theme, are shown in Appendix XI, Figure 53.). There was one borderline higher level case (FOS. u4), which was rated as F.O. for explicitly identifying the function. One subject (L.C.S. j9) was given a vacuous rating for a non thematic response, despite identifying a technical function. Twenty four subjects identified a theme for the following different functions:

- 1) Utilitarian themes: L.C.S. j7, m8, m10; F.O.S. m2, u1, u2, u6;
- 2) Expressive themes: L.C.S. j8, m3; F.O.S. j5, m12; F.O.S. u4;
- 3) Formalist themes: E.C.S. j2, j3, j11; L.C.S m4, m5, m6, m7, m9, m11, u3, u5, u7.

Data analysis indicated that multi-functional thematic associations were literal and psychological and also included references to technical functions and the historical context. However, there were differences in emphasis. The seven Utilitarian explanations used literal and psychological associations with the subject matter to:

- a) generalise the theme as a descriptive summary;
- b) give intentional causes based on thematic actions;
- c) identify the historical context.

Four of the five Expressive explanations (E.C.S. j8, m3; L.C.S. j5; F.O.S. u4) used psychological associations to:

- a) generalise the theme as an emotive state, event or story,
- b) identify intentional causes as emotive actions, or the artist's intention.

There was one literal-technical association that related the pose to the *portrait* genre (L.C.S. m12).

The twelve formalist explanations used analogous literal or psychological associations to relate formal elements to themes. Six subjects (E.C.S. j2, j3, j11; L.C.S. m5; F.O.S. u3, u7) made literal analogous associations with items, actions, locations and events. to explain the theme or intentions. One subject (L.C.S. m4) combined an analogous association with the artist's technical construction of the artwork. Five subjects (L.C.S. m6; F.O.S. m7, m9, m11, u5) made psychological associations with emotive states, the artist's intention, emotive technical associations with colours and technical comparisons of literal and expressive thematic functions.

The categories for three operational levels indicated that the abilities to select and make a functional interpretation and identify a theme had a tripart structure. However, the random selection of artworks did not provide examples of responses for each operational level for each art function. In addition the functional focus on themes needed extending to include technical compositional unity.

6.2.3.2.2. The Abilities to Identify a Title and Give an Alternative Interpretation.

The abilities to identify a title and give an alternative interpretation as another title for the artworks selected in Figure 27 could be assessed according to the complexity of the literal, psychological and technical associations. The following prespecified operational categories for titles and alternative titles were derived from data analysis.

Tautological Categories: 1 Simple Thematic and Technical Functions.

1i. Literal decoding: no examples.

1ii. Techniques:

A) TITLE. Kandinsky: E.C.S. j6;

1iii. Physical cause: no examples.

Circumstantial Categories: 2. Complex Thematic and Technical Functions.

2i. Literal themes.

A) TITLES Hogarth: F.O.S. u1, u6; Matisse: F.O.S. u4; Mondrian: F.O.S. u7; Kandinsky: E.C.S. j2;

B) ALTERNATIVE TITLES. Hogarth: F.O.S. u1; Mondrian: F.O.S. u7;.

2ii. Psychological Themes.

A) TITLES. Bellini: E.C.S. j8; Kandinsky F.O.S. u5.

B) ALTERNATIVE TITLE. Bellini: E.C.S. j8.

2iii. Technical Functions.

A) TITLE. Kandinsky: L.C.S. j9.

Theoretical Categories: 3. Thematic and Technical Functions.

3i. Literal thematic generalisations.

A) TITLE Kandinsky: F.O.S. m9;

3ii. Psychological thematic generalisations

A) TITLE. Manet: L.C.S. j7; Kandinsky: F.O.S. m11;

B) ALTERNATIVE TITLES. Manet j7; Kandinsky: F.O.S. m9, u5.

3iii. Technical Themes.

B) ALTERNATIVE TITLE. Kandinsky: m11.

The responses for the abilities to give a title and an alternative interpretation are shown in Figure 28 and Appendix XI, Figure 54. Separate data analyses were given for the ability to give a title and to give an alternative interpretation in the form of a title.

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psychological associations (E.C.S. j8; L.C.S. j7) but the simpler reference (E.C.S. j2) was regarded as a literal association. In addition two higher level subjects used circumstantial probabilities (F.O.S. u4, u5). Subjects gave titles for the selected artworks (Figure 27). Only twelve subjects, mainly from the higher level samples were able to identify a title (E.C.S. j2, j6, j8; L.C.S. j7, j9; F.O.S. m9, m11, u1, u4, u5, u6, u7). Nineteen subjects, were unable to identify a title (E.C.S. j1, j2, j3, j4, j10, j11, j12, m3; L.C.S. j5, m1, m4, m5, m6, m8, m10, m12; F.O.S. m2, m7, u2, u3).

It was assumed that the large number of negative responses were due to the complexity of the association, which required comprehension of the contents in order to generalise the title.

Titles were identified for each art function. There was evidence that titles were derived from associations with themes and the technical manner of working. The kinds of associations with the three art functions corresponded with the findings for ability to identify a theme. Titles for Utilitarian artworks focused on literal associations with the subject matter and identified roles, the time of day and historical events (Hogarth: F.O.S. u1, u6; Manet: L.C.S. j7). Titles for Expressive artworks included one literal association with a person's name (Matisse: F.O.S. u4) and a psychological association with an emotive event (Bellini: j8). Formalist titles included analogous literal associations with the formal elements (Mandarin: F. O.S. u7; Kandinsky: E.C.S. j2, m9); one psychological association with an emotive event (Kandinsky: F.O.S u5) and three technical associations with intentions and the style of working (Kandinsky: E.C.S. j6; L.C.S. j9; F.O.S. m11).

6.2.3.2.3. The Ability to Revise Interpretations in the Light of the Visual

Evidence.

Data analysis indicated that the ability to revise interpretations in the light of the visual evidence for Manet's (1867A Appendix V) artwork, could be assessed according to the complexity of the literal, psychological and technical associations. Revisions as the identification of additional information, could be checked with earlier descriptions of the artwork (Appendix XI, Figure 55). The following pre-specified operational categories for assessing revisions of interpretations were derived from data analysis of the additional information.

Tautological Categories: 1. Simple Thematic and Technical functions.

1i. Decoding the subject matter: revision of items (E.C.S. j3; L.C.S. j5);

1i. Techniques: no examples.

1ii. Physical cause: no examples.

Circumstantial Categories: 2. Complex Thematic and Technical Functions.

2i. Narrative themes: literal revision of actions (E.C.S. j4, j6, j10, j11; L.C.S. m8) role (E.C.S. j8; F.O.S. u3) events (L.C.S. m9) or location (L.C.S. j7); and confirmation of the thematic location (L.C.S. m6; F.O.S. m9).

2i. Psychological themes: revision of status (*rich*) based on the cost of items (F.O.S. m2).

2iii. Technical Functions: revision of the depiction of attributes (L.C.S. m4) and location from colour (F.O.S. u4).

2iv. Time comparisons as age to revise the dating of the artwork (L.C.S. m11).

Theoretical Categories: 3. Thematic and Technical Functions.

3i. Narrative Thematic Generalisation for revisions of physical properties (*reflection*: L.C.S. m1; F.O.S. u2)

3ii. Psychological Thematic Generalisations: no examples:

3iii. Technical Functions: revision of the thematic function to include the artist's construction of meaning (L.C.S. m4) and compositional unity (the underlying geometric structure F.O.S. u7).

3iv. Hypothetical Arguments: no examples.

3v. Historical Generalisations: no examples.

The operational categories and responses for the ability to revise interpretations

are shown in Appendix XI, Figure 55. There were two lower level borderline

cases. One was rated as E.C.O. for referring to simple items, despite classifying by

6.2.3.2..4. Summary of the Testing of the Tripart Structure of the Holistic

Abilities.

Data analysis indicated that the operational categories for thematic and technical functions, could be used to co-ordinate the assessment of the multi-functional holistic abilities for interpretations and revisions. Multi-functional interpretations could be assessed according to the complexity of the literal or psychological thematic associations, and to a lesser extent technical associations. In theory all of the functions could explain form and meaning relationships in terms of thematic or technical unity. However, Utilitarian and Expressive functions tended to focus on literal and psychological thematic associations, whereas Formalist functions focused on technical associations to infer analogous themes and formal technical unity. The limited thematic focus on the technical construction of meaning was assumed to be due to the research methodology which separated analysis from interpretation.

6.2.4. The Tripart Structure of the Evaluative Abilities.

Data analysis of the tripartite structure of evaluative abilities was separated into the assessment of four functional and three preference abilities. Data analysis indicated that the pre-specified operational categories for assessing thematic and technical functions could be used to assess all of the evaluative abilities. However, evaluative abilities included several combined thematic and technical responses. It was found that separate thematic and technical data analyses were required of combined responses, because literal and psychological associations could be made

a) Utilitarian/Expressive functions (Bellini/Manet-Hogarth: F.O.S. m8;

Manet/Hogarth-Bellini-Matisse: F.O.S. u2)

b) all three art functions: (Kandinsky/Manet-Bellini-Matisse: E.C.S. j12;

Matisse/Kandinsky-Hogarth-Manet: L.C.S. m1).

The majority of subjects (24) matched Expressive artworks with Formalist (14) or Utilitarian (10) artworks.

Data analysis indicated that the reasons given for similarities between artworks, could be assessed according to the complexity of the literal, psychological associations for thematic and technical responses. However, subjects could match any function with any artwork. Therefore subjects were assessed according to the common function identified. The following pre-specified operational categories for assessing the identification of similar functions, were derived from data analysis.

Tautological Categories 1. Simple Thematic and Technical Functions.

1i. Narrative matching of common subject matter and formal elements.

A) Utilitarian: colour of items (E.C.S. j4);

B) Utilitarian/Expressive: colour, texture (E.C.S. j1; j2), simple formal variety and comprehension of items (E.C.S. j11; L.C.S. m12) actions (L.C.S. j5); 1ii. 1ii.

Matching techniques: implicit with formal element above.

1iii. Matching of all three functions, through global fusion of colour (E.C.S. j12).

Circumstantial Categories 2. Complex Thematic and Technical Functions.

2i. Matching narrative themes and technical rules. Utilitarian/Expressive: through common actions (L.C.S. j7);

2iii. Matching psychological themes and rules. Utilitarian/Expressive: through common psychological states and actions (F.O.S. *bored*, m2);

2iii. Matching Technical Functions and Rules.

A) Utilitarian/Expressive: through common amounts of *detail* (L.C.S. m8; F.O.S. u1);

B) Utilitarian/Formalist: common real action and *smooth* painting (E.C.S. j8); C) Expressive/Formalist: through common *colours* (E.C.S. j3) with *pattern* (L.C.S. m5), colour dominance (L.C.S. m4), emotive colour (F.O.S. m7, u4), and the technical process with exceptions (F.O.S. m9, u7) D) All functions through *warmth* of colour (F.O.S. u1).

Most subjects identified similarities through literal technical associations with:

a) the formal elements, mainly colour (E.C.S. j1, j2, j3, j4, j12; L.C.S. m5, m6, m12; F.O.S. m9, u7);

b) techniques, mainly painting (E.C.S. j8; L.C.S. m1; F.O.S. m9, u7) c) technical rules for *detail, real form, figurative art* (L.C.S. m8, m10; F.O.S. u2).

Four subjects made psychological associations with the technical rules for:

dominance (L.C.S. m4) emotive colour (F.O.S. m7; u4) and style (F.O.S. u5).

There were nine thematic associations. These consisted of four literal associations with items or actions (E.C.S. j8, L.C. S. j5, j7, m10) and five psychological associations with states, actions or order (F.O.S. m3, m2, m7, m11, u6). The categories for three operational indicated that this ability had a tripart structure.

6.2.4.1.2. The Ability to Evaluate a Composition.

Data analysis indicated that the ability to evaluate a composition, as a good arrangement, could be assessed according to the complexity of the literal and psychological associations for thematic and technical responses. The following pre-specified operational categories were derived from data analysis.

Tautological Categories:

1. Simple Evaluation of Thematic and Technical Unity.

1i. The narrative thematic items (E.C.S. j1);

1ii. Techniques as the arrangement of items (E.C.S. j6);

1iii. Assertion as *yes* (E.C.S. j4)

Circumstantial Categories: 2. Complex Evaluation of Thematic and Technical Unity.

2i. The narrative thematic items (E.C.S. j11, j12), actions (E.C.S. j3; L.C.S. m5) with reservations about thematic interest (L.C.S. m4), the thematic location (L.C.S. j5);

2ii. The psychological composition as *neat and tidy* (E.C.S. j8), involved an implicit evaluation of order.

F.O.S. *quite good, well* m7 ; *better*, m9). Seven subjects used ranking by amount (E.C.S. *all*, j2, j8, m3; L.C.S. *a bit*, m12; F.O.S. *a bit*, m7; *two*, m7; *a lot*, u4, u5) including length of time (F.O.S. u4). There were also three hypothetical evaluations (L.C.S. m12; F.O.S. m9, u7).

Subjects could evaluate arrangements for thematic and technical compositional unity. The twelve evaluations of thematic unity were mainly through literal associations with reality. i.e. truth to life. These included references to items, actions or the thematic location (E.C.S. j1, j3, j6, j12; L.C.S. j5, m4, m5) physical reality (E.C.S. j11; L.C.S. m1). These references involved an implicit evaluation of realistic techniques. There were also three psychological associations, which evaluated thematic unity through: implicit order (*neat and tidy*, E.C.S. j8) thematic interest of actions (L.C.S. m4), and mood through the immediacy of the spectator involvement (F.O.S. m11).

The twenty technical evaluations involved the use of eleven literal associations with:

- a) the use of colour (E.C.S. m3), and texture (E.C.S. j10). b) the spatial structure (E.C.S. j2, j6; L.C.S. j7, m6; F.O.S. m2);
- c) technical rules (painting skill and clarity, L.C.S. m7; balance: implicit symmetry F.O.S. u3; and the underlying geometry to facilitate viewing, F.O.S. u6);
- d) a hypothetical evaluation of depth and clarity (L.C.S. m12).

There were also nine psychological associations with:

a) the technical rules for psychological merit: variety of colour (L.C.S. j9), realistic novelty (L.C.S. m8, m10), balance (F.O.S. u1, u5), dominance (*striking* F.O.S. u2) and length of time for variety and attention (F.O.S. u4).

b) hypothetical evaluation based on relative comparisons of the artist's attention (F.O.S. m9) and technical rules (unity-attention F.O.S. u7).

The categories for three operational levels derived from data analysis indicated that this ability had a tripart structure. However, the projected modal measure needed to include evaluations of compositional unity for literal and psychological themes.

6.2.4.1.3. The Ability to Evaluate Technical Merit as Accuracy.

The data for assessing the ability to evaluate the technical merit as accuracy through comparisons with reality, was derived from the ability to evaluate a composition. The assessment corresponded with the assessment of literal thematic unity (E.C.S. j1, j3, j11, j12; L.C.S. m1. m4, m5); two literal-technical rules (painting skill as clarity, F.O.S m7: and a realistic arrangement, F. O.S. m2); one hypothetical evaluation (depth and clarity, L.C.S. m12). These associations for themes or techniques, were all literal. Evaluations of technical merit were present in all three operational categories, which indicated that this ability had a tripart structure. No separate rating was given for this ability.

One was rated as L.C.O. for use of a physical generalisation (*outline*, F.O.S. u2). Two were rated as F.O. a relative comparison. (E.C.S. j8) and generalisation of *main points* (F.O.S. u7). Unsupported probabilities (E.C.S. j2; L.C.S. j7) were rated at L.C.O. and reciprocal rules at F.O. (L.C.S. m4). All but five subjects were able to identify alternative materials, with one formal operational response (*alfresco*, F.O.S. u1). The five negative responses (E.C.S. j4; j12; L.C.S. m1; m6; F.O.S. u3), for lower level responses were assumed to be due to lack of mental flexibility, and higher level responses due to lack of knowledge.

All but nine subjects were able to evaluate materials. There were eight negative responses, including the five negative responses for alternative materials, and three further unsupported responses (E.C.S. j2; L.C.S. j7; F.O.S. u4). The unsupported responses were assumed to be due to an inability to make an imagined comparison of materials. The twenty-two evaluations consisted of:

- a) three agreements with the appropriateness of the alternative materials (F.O.S. j8; L.C.S. j5, j9)
- b) Eighteen disagreements based on the lack of appropriateness of the alternative material (E.C.S. j1, j3, j6, j10, j11, m3; L.C.S. m5, m8; F.O.S. m7, u1, u6), or confirmation of the appropriateness of the initial identification of materials (L.C.S. m10, m12; F.O.S. m2, m9, u2, u5, u7)
- c) one uncertain evaluation (F.O.S. m11).

Subjects also used ranking by amount (E.C.S. j10, j11; L.C.S. j9, m5; F.O.S. m2, m9, m11, u7), quality (E.C.S. j8, m3; L.C.S. m12; F.O.S. m7, u7) and the *same*

(F.O.S. U5). There were six circumstantial (E.C.S. j3, j11, m3; F.O.S. u1, u2, u6) and two theoretical (F.O.S. m9, u7) hypothetical evaluations.

The majority of the twenty two subjects evaluated appropriateness with literal technical associations, through comparisons with::

- a) physical reality, including temperature (E.C.S. j1, j3; F.O.S. m2)
- b) the use of: the formal elements (E.C.S. j10, j11; L.C.S. m5; F.O.S. m11); materials (E.C.S. j6; L.C.S. m8) processes (L.C.S. j5, m10, m12; F.O.S. m7, u1) art forms (E.C.S. j8);
- c) technical rules (F.O.S. m9, u6, u7).

Four subjects made psychological associations for appropriateness, with colour warmth, (F.O.S. u5), and technical rules for importance (E.C.S. m3) and dominance (L.C.S. j9; F.O.S. u2). The categories for three operational levels indicated that this ability had a tripart structure. However, the modal measure needed to include evaluations based on physical reality.

6.2.4.1.5. The Ability to Evaluate the Originality of an Artwork.

Data analysis indicated that the ability to evaluate originality, according to the degree of departure from established themes and techniques, could be assessed through the complexity of the literal, and psychological associations. Thematic and technical evaluation was assessed through:

- a) agreement, with evidence of differences;
- b) disagreement, with evidence of similarities, or lack of original qualities.

L.C.S. m3; F.O.S. m2), and identifying the historical context (F.O.S. m11). All but three subjects evaluated the originality of the artwork. The three negative responses (E.C.S. j1, j2, j4), were assumed to be due to an inability to associate originality with differences.

Ten subjects agreed with the evaluation of originality (E.C.S. j3, j8, j11, j12: L.C.S. j9, m8; F.O.S. m9, m11, u3, u6). These included subjective evaluations of new to them (E.C.S. j8; L.C.S. j5) to other's (L.C.S. j9) or from the *factory* (E.C.S. j12). Thirteen subjects disagreed with the evaluation of originality (E.C.S. j10, m3; L.C.S. j7, j9, m1, m4, m6; F.O.S. m2, u1, u2, u3, u5, u7). These included rules for originality (F.O.S. *revolutionary*, u5; relative to the artist's interpretation, u7). There was one further relative rule based on the *artist's perspective* (F.O.S. u4). There were two uncertain evaluations, because of difficulties with comprehension (L.C.S. m5) and methods of evaluation (L.C.S. m7).

Ten subjects made thematic evaluations of originality, through literal associations with similarities or differences of items, the location, events and historical life styles (E.C.S. j3, j6, j10, j12 L.C.S. j5, j9, m1; m10, m12;) F.O.S. u2) Nineteen subjects made technical evaluations. Fourteen subjects used literal comparisons.

Seven subjects compared differences for agreement through:

- a) the drawing of depth clothes (L.C.S. j8, j11)
- b) novelty as unusual realistic compositions (L.C.S. m5; F.O.S. u6),
- c) relative evaluations of the artist's *perspective* (F.O.S. u4), interpretation (F.O.S. u7), through reciprocal comparisons with reality (*scene*);

6.2.4.2.1. The Ability to Evaluate Pleasing Qualities.

Data analysis indicated that the ability to evaluate thematic and technical pleasing qualities, by giving reasons for the best of six artworks, could be assessed according to the complexity of the literal and psychological associations. The following pre-specified operational categories were derived from data analysis of preferences for the best of six artworks (Figure 27) represented by the artist's names.

Tautological Categories: 1. Simple Evaluation of Themes and Techniques.

1i. Narrative Decoding of Subject Matter/Formal Elements

Hogarth: pleasing variety of items (E.C.S. j4).

Manet: pleasing fighting theme (L.C.S. j7).

Kandinsky: pleasing formal elements: *colourful* (E.C.S. j6), *shape and colour* (F.O.S. u3); variety of colour (E.C.S. j10; L.C.S. j9) with *pattern* (E.C.S. j11).

1ii. Techniques. Kandinsky: pleasing use of line (E.C.S. j3).

1iii. Assertion of preference for Kandinsky (E.C.S. j12).

Circumstantial Categories: 2. Complex Evaluation of Themes and Techniques.

2i. Narrative Theme, Formal Elements and Rules.

Hogarth: pleasing realistic qualities (E.C.S. j8);

Bellini: pleasing colour and theme (L.C.S. j5);

2ii. Psychological Themes and rules.

Hogarth: pleasing *happy feelings and interest* (E.C.S. j1).

Bellini: pleasing people's feelings (E.C.S. m3).

Kandinsky: *pleasing feelings and interest* (F.O.S. u5).

2iii. Technical Functions and Rules.

Manet: pleasing *interest* (F.O.S. u2); Matisse: pleasing style of painting (L.C.S.

m12); Kandinsky: pleasing *imagination, colour and interest* (E.C.S. j2); colour

curiosity for interest (L.C.S. m6); variety of: exciting actions (L.C.S. m1) formal elements and media (F.O.S. m7);

2iv. Time Comparisons: no examples.

Theoretical Categories: 3. Evaluation of Themes and Techniques.

3i. Narrative themes and rules.

Hogarth: pleasing complexity (L.C.S. m8); and *detail of everyday things* (F.O.S. m2);

3ii. Psychological themes and rules:

Hogarth: pleasing humour (F.O.S. m2)

Matisse: pleasing anger for themes, the spectator, the artist and colour dominance (F.O.S. m11);

3iii. Technical Functions and Rules.

Hogarth: pleasing skill (*detail and precision*, F.O.S. u1).

- a) Utilitarian artworks: Hogarth: *more real* (E.C.S. j8), *everyday things* (F.O.S. m2), contextual *lifestyles* (L.C.S. m10; Manet: *cowboys, indians, fighting and blood* (L.C.S. j7).
- b) Expressive artworks: Bellini: appearance when dead (L.C.S. j5);
- c) Formalist artworks: either analogously (Kandinsky, *surviving* F.O.S. m9) or as a message (Mondrian F.O.S. u7).

There were five psychological thematic associations, which were distributed between the following three art functions.

- a) Utilitarian artworks: Hogarth: thematic (E.C.S. j1) and spectator (F.O.S. u6) feelings
- b) Expressive artworks: Bellini: thematic and spectator feelings (E.C.S. m3);
- c) Formalist artworks: Kandinsky: thematic (F.O.S. u5) spectator and artist's feelings (F.O.S. m11).

Twenty-five subjects made technical preferences. Fourteen literal associations were distributed between the following three art functions.

- a) Utilitarian artworks: Hogarth: *colour* (E.C.S. j1) and technical rules (variety of items and colours, E.C.S. j4; clarity as *detail* F.O.S. m2. and *precision* F.O.S. u1);
- b) Expressive artworks: Bellini: *colour* (E.C.S. j5);
- c) Formalist artworks: Kandinsky: *colour* (E.C.S. j2, j6; L.C.S. m6; F.O.S. u3); the technical process (use of line, E. C.S. j3); and technical rules (variety of colour, E.C.S. j10, j11; L.C.S. j9, media, F.O.S. m7).

Fifteen psychological associations were distributed between the following three art functions;

- a) Utilitarian artworks: technical rules (Hogarth: interest through complexity, L.C.S. m8; and *interest* for Manet, F.O.S. u2)
- b) Expressive artworks technical rules (Bellini; variety of formal elements and facial expression, F.O.S. u4 ; Matisse: interest for the style of painting, L.C.S. m12).
- c) Formalist artworks: Kandinsky: *planning*, F.O.S. m11; *problem solving*, F.O.S. m9; and exciting actions unity of design, L.C.S. m4 and organisation: Mondrian F.O.S. u7; technical rules: L.C.S. m1; emotive colour dominance, F.O.S. m11; *interest*, F.O.S. u5. for curiosity or attention to pictures inside, L.C.S. m5, m6, m1, and with *imagination*, E.C.S. j2.

The majority of technical associations were for formalist artworks (16).

Data analysis indicated that preference evaluations corresponded with functional evaluations of themes and techniques, for three art functions.

Preference evaluations of the best artwork focused on comparisons of differences, including the historical context and ranking by amount (E,C,S, j8; L.C.S. m12; F.O.S. m9, u5, u7) or quality (L.C.S. m6). Only four subjects referred to other artworks (E.C.S. j8; L.C.S. m12; F.O.S. u5) or styles (L.C.S. m4). The categories for three operational levels, derived from data analysis indicated that this ability had a tripart structure.

6.2.4.2.2. The Ability to Give Reasons for Preferences.

The data for assessing the ability to give reasons for preferences was derived from the ability to evaluate pleasing qualities. Therefore the assessment procedures and findings were the same and no separate rating was given. All but one of the subjects gave reasons for preferences (E.C.S. j12). Thematic and technical reasons were given for all three art functions. In addition the categories at three operational levels indicated a tripart structure for this ability.

6.2.4.2.3. The Ability to Comparatively Evaluate the Merits of Several Artworks.

The data for assessing a comparative evaluation of the merits of several artworks, was derived from the responses for the interpretive ability to infer pleasing qualities. Therefore, the assessment procedures were previously described (p. 250) and the operational categories and responses shown in the Appendix XI, Figure 52. Subjects compared the merits of the two Formalist artworks with paired Utilitarian and Expressive artworks. Data analysis indicated that all subjects could comparatively evaluate the merits of several artworks by ranking the amount of preference (more or less). However, only seventeen subjects gave reasons for preferences, as previously described.

Twenty-three subjects preferred the formalist artworks more than the other artworks, although one subject included Manet's artwork (F.O.S. u2). These preferences were evaluated by:

a) ranking by quality (Kandinsky, *best*, F.O.S. m11) and amount (*more*) for the Formalist artworks (E.C. S. j1; j2, j3, j6, j8, j10, j11, j12; L.C.S. j9, m1, m6, m10;

F.O.S. m7, m9, m11 u1, u3, u5, u7) and Formalist *more than* Utilitarian artworks (L.C.S. m4, m5), Formalist and Manet *more than* the rest (F.O.S u2)

b) thirteen comparisons of preferred qualities for formalist artworks (*colour, pattern or interest* (E.C.S. j2, j3, j6, j8, j10, j11, j12; L.C.S. j9, m1, m10; F.O.S. m7, m9, u1) with one reference to exciting *brightness* (F.O.S. u1) and one assertion (E.C.S. j1)

Seven subjects preferred Formalist artworks less than the Utilitarian and Expressive artworks The six preferences for Utilitarian artworks were evaluated by:

- a) ranking by amount either less for formalist (E.C.S. j4; L.C.S. m12; F.O.S. u6) or more for a preferred artwork (L. C.S. m4, m8; F.O.S. m2);
- b) comparisons of qualities for a preferred artwork (*pretty and bright*, E.C.S. j4), or missing from formalist artworks (*realistic interest*, L.C.S. m12; *realism*, u6);

The one preference for an expressive artwork was based on ranking all three functions (*not as much, more than*, E.C.S. m3). Two subjects had an equal preference for all six artworks, based on colour as global fusion (E.C.S. j5) and agreement (same, L.C.S j7). One subject preferred all but Mondrian's artwork (*not as much*, F.O.S. u4).

Data analysis indicated that comparative analysis based on ranking by amount (more or less) and preferences for merit were possible at all levels of development. However, higher levels were required for ranking and comparing the merits of two or more functions. The categories for two operational levels indicated that this was

a bipart ability. This was because no subjects made theoretical evaluations. In addition, the measure needed to include the method of ranking, as well as reasons for preference, for assessing this ability.

6.2.4.3. Summary of the Testing of the Tripart Structure of the Evaluative Abilities.

Data analysis indicated that functional and preference evaluative abilities involved the assessment of thematic and technical responses for all three art functions.

Mixed thematic and technical methods of evaluation required separate data analyses of the corresponding literal and psychological associations. Combined thematic and technical responses, were assessed according to the most complex association. Data analysis indicated that all subjects could evaluate themes and techniques through preferences (like) and reasons for agreement or disagreement. These could be assessed through the use of assertions or comparisons of similarities and differences. However, the complexity of the methods of ranking for evaluation also required assessing e.g.

Early concrete simple ranking by: agreement as the *same everything*;, amount (*lots of (variety) more, less*); quality (*good bad*);

Late concrete complex ranking by comparisons with reality (*like, real, normal*); amount; quality (*most, best, better*) psychological states (*striking, exciting*) historical time for the context and the manner of working.

Formal ranking by generalising time comparisons for the context and styles.

6.2.5. Data Analysis of the Contextual Abilities.

Data analysis indicated that the tripartite structure of the contextual abilities could be assessed through the pre-specified thematic and technical functions

categories used to assess the visual abilities. All of the contextual abilities could be assessed according to the complexity of the thematic or technical responses through literal and psychological associations. The contextual abilities consisted of two subsets:

- 1) five intentional abilities;
- 2) twelve historical abilities including five stylistic abilities, six art-historical abilities and one contemporary criticism ability.

6.2.51 Data Analysis of the Intentional Abilities.

Data analysis indicated that the planning ability could be assessed with the prespecified operational categories for the manner of working (analysis). The remaining abilities to: infer reasons for intentions, relate intentions to visual cues (interpretation and analysis) compare own responses with the artist's intention (evaluation) and identify difficulties in comprehending the visual evidence (reflection) could all be assessed with the prespecified operational categories for thematic and technical functions (interpretation -evaluation).

All of the intentional responses were given for one selected artwork. The subjects selected artworks that represented all three art functions (Pepper, 1952).

- a) Four subjects selected Hogarth's artwork (L.C.S. m1. , m5, m6, m12).
- b) Four subjects selected Manet's artwork (E.C.S. j2, j10, m3; F.O.S. u5).
- c) Three subjects selected Bellini's artwork (E.C.S. j11; L.C.S. m4; F.O.S. u6).
- d) Six subjects selected Matisse' artwork (E.C.S. j1, j8; L.C.S. j5; F.O.S. m2, m7, u7).

d) Eleven subjects selected Mondrian's artwork (E.C.S j3, j4, j6, j12; L.C.S. j9, m8, m10; F.O.S. (m11, u2, u3).

e) Three subjects selected Kandinsky's artwork (L.C.S. j7; F.O.S. u1, u4).

The majority of subjects selected Mondrian's simple formalist construction.

6.2.5.1.1. The Ability to Relate the Artist's Planning to Production.

Data analysis indicated that the ability to relate planning to production, could be assessed according to the complexity of the literal and psychological associations with the thematic or technical manner of working. The following pre-specified operational categories for the manner of working, were derived from data analysis of sequential associations.

Tautological Categories: 1. Simple Technical Sequences.

1i. Decoding items: no examples.

1ii. Techniques with location. Manet: E.C.S. j10; Mondrian: E.C.S. j12.

Circumstantial Categories: 2. Complex Technical Sequence.

2i. Technical Processes. Manet: items, colour, depth, location (E.C.S. m3);

Bellini: items and overlap (E.C.S. j11)

Matisse: items with depth (E.C.S. j1)

Mondrian: location comparison (E.C.S. j3) *draw* (E.C.S. j4) with location (L.C.S. j9) or colour sequence and exceptions (F.O.S. m9).

2ii. Technical Rules. Hogarth: items in depth then details (L.C.S. m1);

Bellini: motive related to three figures, with *detail* then *highlights* (F.O.S. u6);

Matisse: care with media for rough and real work (E.C.S. j8); media and techniques for *nice art* (L.C.S. j5) depth with *outline*, simple then detailed (F.O.S. m2), planning with colour variety (F.O.S. m7)

Mondrian: location with variety of items and colour (L.C.S. m10); motive related to selection of colours (E.C.S. j6; L. C.S. m8)

Kandinsky: variety of items with techniques and drawing (L.C.S. j7);

2iii. Thematic Unity: no examples.

2iv. Artist's Intention. (all responses).

2v. Simple Historical Context: no examples.

Theoretical Categories: 3. Technical Sequence.

3i. Technical Rules. Manet: *special effects like a photograph*, with items and depth (E.C.S. j2);

Matisse: decisions for planning with colour variety (F.O.S. m7);

Mondrian: choice of formal elements with formative planning (F.O.S. m11); implicit unity of lines and angles (F.O.S. u2), location with variety of shape and colour impact (F.O.S. u3)
 Kandinsky: random order of items with colour sequence for an *experiment* (F.O.S. u4) and definition (F.O.S. u1).
 3ii. Thematic Composition and Technical Rules. Hogarth: an *idea* for rough drawing, media and techniques (L. C.S. m4), *characters and scenery* (L.C.S. m6). Manet: *happenings*, with sketching, colour definition and artistic license (added items/changes) for impact (F.O.S. u5).
 Bellini: *truth* of Biblical story related to technical accuracy (L.C.S. m5);
 3iii. Hypothetical Argument. Matisse: use of media techniques related to a portrait (F. O.S. u7).
 3iv. Historical Context. Hogarth: *idea* for retrospective *lifestyles*, with *details* and historical research (L.C.S. m12).

The operational categories and responses are shown in Appendix XI, Figure 61.

There were thirteen higher level borderline cases. Three were rated as L.C.O. for references to *minor* (L.C.S. m1), *highlights* (F.O.S. u6) and examples of colour exceptions (F.O.S. m9). Ten were rated as F.O. for references to *effects* (E.C.S. j2; F.O.S. u7), *random order* (L.C.S. m4), *truth* (F.O.S. m5) *decided* (F.O.S. m7) *plan in his mind* (F.O.S. m11) *impact* (F.O.S. u3) *definition* (F.O.S. m7), *separating* (F.O. S. u2).

All of the subjects were able to relate the artist's planning to the production.

Subjects referred to the artist's actions implicitly (E.C.S. j4, j8, j11) and explicitly as *he* (E.C. S. j1, j3, j10, m3; L.C.S. j7, j9, m1, m6, m10, m12; F.O.S. m2, m7, m11) or *they* (E.C.S. j12; F.O.S. m9). In addition subjects referred to the artist's intentions as *wants* (*three figures* F.O.S. u6), *plan* (F.O.S. u2), *selection* of formal elements (E.C.S. j6; F.O.S. m11), *saying the truth* (L.C.S. m5), *topic* for painting meaning (F.O.S. m7, u7), *idea* (L.C.S. m4) in the historical context (L.C.S. m12) , *photograph* (E.C.S. j2), *a happening* (F.O. S. u5), *dominance* (L.C.S. m8;; F.O.S.

u3), *an experiment* (F.O.S. u1) and nice art (L.C.S. j5). There was one disagreement with an intentional act (F.O.S. u1).

All but two subjects, who only referred to a specific technique (E.C.S. j8; L.C. S. j5), were able to sequence a process. However, four subjects required a 'then' prompt (E.C.S. j1, j2, j4, j11). There was one hypothetical argument giving reasons for a planned portrait (F.O.S. u7). Only eight subjects included pre-planning with making (E. C.S. j8; L.C.S. m4, m8; F.O.S. m7, m11, u2, u5 u7). There was a one reference to historical research (L.C.S. m12). Sequences were either related to the thematic composition or technical processes. Thematic sequences referred to:

- a) the location of the subject matter (E.C.S. j1, j2, j11, m3; L.C.S. m1, m6, u5),
- b) with thematic rules (*special effects*, E.C.S. j2; *detail*, L.C.S. m1, m2, m12; accuracy, L.C.S. m5; artistic license, F.O.S. u5; *highlights*, F.O.S. u6).

The technical associations for thematic sequences were mainly literal (E.C.S. j1, j2, j11, m3; L.C.S. m1, m6, F.O. S. m2, u5), with three psychological associations (L.C.S. *idea*: m4; *truth*, m5; F.O.S. *wanted*, u6). Technical sequences referred to:

- a) the location of formal elements and techniques (E.C.S. j3, j4, j6, , j10, j12; L.C.S. j5, j7, j9, m8, m10; F.O.S. m7, m11, u2, u3,) a colour sequence (F.O.S. u4) and exceptions (F.O.S. m9);
- b) with technical rules (dominance, L.C.S. j8; F.O.S. u3; random order, F.O.S. u4; variety: L.C.S. m10, F.O.S. m7, u3, u7; *definition* F.O.S. u1).

There were an equal number of literal (observed processes: E.C.S. j3, j10, j12; L.C.S. j7, j9, m10; F.O.S. m9, u1, u4) and psychological (E.C.S. *wanted*, j6; *careful*, j8; L.C.S. *nice* j5; *which one's stood out*, m8; F.O.S. *choose*, m11; *decided*, m7; *plan*, u2; *what looked best*, F.O.S. u3) associations for technical sequences. Two subjects used psychological associations to combine thematic intentions, with techniques (*idea*, L.C.S. m4; *portrait*, F.O.S. u7).

In relation to the three art functions all but one of the Utilitarian intentions (Hogarth/Manet) were thematic. The Expressive intentions were thematic for Bellini's artwork and mainly technical for Matisse' artwork. All of the formalist intentions (Mondrian/Kandinsky) were technical. The categories for three operational levels indicated that the this ability had a tripart structure. However, the use of thematic-technical intentions, would depend on the perception of the artworks function.

6.2.5.1.2. The Ability to Infer Reasons for the Artist's Intention.

Data analysis indicated that the thematic and technical reasons given for the artist's intention, could be assessed according to the complexity of the literal and psychological associations. The following prespecified operational categories for assessing thematic and technical functions, were derived from data analysis of reason's for the artist's motives.

Tautological Categories: 1. Simple Thematic-Technical Intentions.

1i. Narrative naming of preference (Mondrian: *colour* L.C.S. j9), and emotions (Matisse: *hate* E.C.S. j8);

1ii. Techniques: *coloured* (Mondrian: L.C.S. j12)

1iii. Physical Cause: no examples.

Circumstantial Categories: 2. Complex Thematic-technical Intentions.

- 2i. Narrative Thematic Decoding: real events (Bellini: L.C. S. m5) or analogous items (Kandinsky: *planet* L.C.S. j7);
- 2ii. Psychological Thematic Decoding: status (Hogarth, L.C. S. m6), moral issues (Manet: *race* E.C.S. m3); general feelings (L.C.S. m8) the artist's feelings (Bellini E.C.S. j11; Mondrian: F.O.S. u3; Kandinsky, u4) and spectator's feelings (Matisse: m7).
- 2iii. Technical Functions: minimal use of colour (Mondrian: m11) and rules for novelty (Mondrian: L.C.S. m9) with *interest* (Matisse: E.C.S. j1); display with the artist's preference for drawing (Matisse: L.C.S. j5) and thematic skill (Hogarth: L.C.S. m4); the artist and viewer's evaluation (Mondrian: E.C.S. j3) and economic intentions (Manet: E.C.S. j2).
- 2iv. Time Comparisons: no examples.

Theoretical Categories : 3. Thematic-Technical Intentions.

- 3i. Narrative Thematic Generalisations and Rules: no examples;
- 3ii. Psychological themes: didactic display of issues/feelings (Hogarth: *things not perfect* L.C.S. m1 Manet: *shooting not right* E.C.S. m3; disagreement, F.O.S. u5), and general emotions (Mondrian: *enjoyment* F.O.S. u2).
- 3iii. Technical Functions and Rules: *an impression* (Matisse: F.O.S. u7), *attention with warmth* for novel theme (Kandinsky: F.O.S. u1).
- 3vi. Hypothetical Argument: no examples.
- 3v. Historical Generalisation: interesting contextual theme (Hogarth: L.C.S. m12) and historical art practice (Bellini: Biblical narrative, F.O.S. u6).

The operational categories and responses are shown in Appendix XI, Figure 62.

There were five higher level borderline cases. These were rated as F.O. for:

contextual analysis (L.C.S m12; F.O.S. u6), a didactic issue (E. C.S. m3), theme *difficult to imagine* (F.O.S u1) and *enjoyment* (F.O.S. u2). All but five subjects (E.C.S j4, j6, j10; L.C.S. m10; F.O.S. m2) were able to give reasons for the artist's intentions. It was assumed that negative responses were due to an inability to associate motives with visual cues. Subjects identified thematic and technical intentions.

Thematic intentions were related to:

- a) a narrative communication of events (L.C.S. m5 analogous (L.C.S. j7) or interesting contextual themes (L.C.S. m12);

b) a psychological communication of:

- i. themes: status (L.C.S. m6), didactic issues/feelings (*perfect* L.C.S. m1; *race* : E.C.S. m3; F.O.S. u5);
- ii. general feelings (E.C.S j8; L.C.S. m8; F.O.S. u2), the artist's feelings (E.C.S. j11; F.O.S. u3, u4) and spectator's feelings (L.C.S. m7). Thematic intentions involved the use of literal (L.C.S. j7, m5, m12) and psychological (E.C.S. j8, j11, m3; L.C.S. m1, m6, m8; F.O.S. m7, u2, u3, u4, u5) associations.

Technical intentions were related to:

- a) technical motives as interest (E.C.S. j1), novelty (E.C. S. j1; L.C.S. m9) with attention for themes (F.O.S. u1), minimalism (F.O.S. m11), an *impression* (F.O.S. u7), the artist's preference (L.C.S techniques, j5; *colour*, j9) and art historical influences (F.O.S. u6).
- b) display (E.C.S. j12; L.C.S. j5) for themes (E.C.S m3; L.C.S. m1, m4, m12; F.O.S. u5) and artist's/viewer's evaluation (E.C.S j3).
- c) economic intentions (E.C.S j2).

Technical intentions involved the use of literal, (E.C.S. j2, j12; F.O.S. m11, u6) and psychological associations (E.C.S j1, j3; L.C.S. j5, j9, m4; F.O.S m9, u1, u5, u7).

In relation to the three art functions Utilitarian intentions were thematic with one economic intention, whereas Expressive and Formalist intentions were thematic and technical. The categories for three operational levels indicated that this ability

had a tripart structure. References to intentions, like planning depended on perceptions of the art function.

6.2.5.1.3. The Ability to Relate Visual Cues to Intentions.

Data analysis indicated that relating visual cues to intentions, could be assessed according to the complexity of the literal and psychological associations. The following pre-specified categories for assessing thematic and technical intentions were derived from data analysis of visual cues used to support intentions.

Tautological Categories: 1. Simple Thematic and Technical Intentions.

1i. Decoding Visual Elements: Mondrian: *colour*, L.C.S. j9)

1ii. Technical functions: display and people's preferences (Matisse: L.C.S. j5). 1iii.

Physical cause of harm (Bellini: *wounds* E.C.S. j11).

Circumstantial Categories: 2. Complex Thematic and Technical Intentions.

2i. Narrative decoding of a story (Bellini: items and location, L.C.S. m5);

analogous theme from formal elements (Kandinsky: *rocket* L.C.S. j7).

2ii. Psychological decoding of emotive facial expression and actions (Hogarth, L.C.S. m6), emotive dominance (Manet, F.O.S. u5), the emotive use of formal elements (Mondrian: L.C.S. m8) and the rejection of narrative painting for lack of excitement (Bellini: *flat* F.O.S. u6).

2iii. Technical comparisons of: colour technique (Matisse: E.C.S. *not smoothly* j1; movement and brushstrokes j8; *brightness* F.O.S. m7; Mandarin: restricted colour, F.O.S. m11; Kandinsky: *warm and rich* F.O.S. u1); display with a *photo frame* (Mondrian, E.C.S. j3); the artist's preference for novelty (Mondrian: F.O.S. u2) and pride in production (Hogarth, L.C.S. m4).

2iv. Time comparisons: economic intentions related to the age of the artwork (Manet, E.C.S. j2).

Theoretical Categories: 3. Thematic and Technical Intentions.

3i. Narrative themes: no examples.

3ii. Psychological themes: location of items related to perfection and relaxed order for family life (Hogarth, L.C. S. m1).

3iii. Technical decoding of: order (Mondrian: *boring linear* F.O.S. u3; Kandinsky: random related to feelings, F.O.S. u4) style for emotive contrasts (Matisse: *impressionist* F.O.S. u7) novelty of genre (Mondrian: *not portrait-abstract still life* F.O.S. m9).

3iv. Hypothetical Argument: decoding items for racial issues (Hogarth, E.C.S. m3).

3v. Historical Generalisations: decoding details of items for contextual *life-styles* (Hogarth: L.C.S. m12).

The operational categories and responses for the ability to relate visual cues to intentions are shown in Appendix XI, Figure 63. There were two borderline higher level cases that were rated as F.O. for *abstract* (F.O.S. m9), and a generalisation (*linear* F.O.S. u3). All but six subjects could relate visual cues to intentions. The six negative responses included the five subjects who were unable to identify intentions (E.C.S. j4, j6, j10; L.C.S. m10; F.O.S. m2). It was assumed that the remaining subject (E.C.S. j12) was unable to decentre to identify visual cues.

Subjects identified thematic and technical visual cues, that corresponded with reasons for intentions. The visual cues supported thematic intentions for:

- a) narrative and historical themes, by decoding items, their location and details (L.C.S. m5, m12) and analogously (L.C.S. j7);
- b) psychological themes by decoding facial expression and actions (E.C.S. m3; L.C.S. m6; F.O.S. u5) and relaxed order (L.C.S. m1).
- c) general feelings through decoding appearance (L.C.S. m8) and brushstrokes (E.C.S. j8), comparing expressive and narrative functions (F.O.S. u6);
- d) the artist's feelings/preferences from decoding items (*wounds* E.C.S. j11); order (F.O.S. *linear* u3; *random* u4) and novel painting (F.O.S. u2);
- e) spectator's feelings by decoding colour dominance (F.O.S. m7).

The associations for thematic intentions were literal (E.C. S. j11; L.C.S. j7, m5, m12; F.O.S. m7, u3, u4) and psychological (E.C.S. m3; L.C.S. m1, m6, m8; F.O.S. u2, u5, u6).

The visual cues supported technical associations for:

a) technical motives through: the use of colour (E.C.S. j1, L.C.S. j5, j9; F.O.S. m11, u1), genre for novelty (F.O.S. m9) contrasting sad items and bright surroundings (F.O.S. u7);

b) display: through comparison with photographic functions (E.C.S. j3) people's preferences (L.C.S. j5) and artist's pride (L.C.S. m4).

c) economic intentions through the age of the artwork (E.C. S. j2).

The associations for technical intentions were literal (E.C.S. j1, j2, j3, j6, j10; L.C.S. m9, m11) and psychological (L.C. S. j5, m4; F.O.S. u1, u7).

In relation to the three art functions subjects used literal and psychological associations for all three functions. Time associations were made with economic intentions for Utilitarian functions and with the art historical context for Formalist functions. The categories for three operational levels indicated that this ability had a tripart structure. However the modal measure needed to include economic intentions.

6.2.5.1.4. The Ability to Compare Own Response with the Artist's Intention.

Data analysis indicated that an evaluation of the thematic and technical correspondence between the subject's own response and the artist's intention, could be assessed according to the complexity of the literal and psychological associations. The following pre-specified operational categories for assessing thematic and technical intentional comparisons were derived from data analysis of agreement or disagreement between two projected intentions. However, there was

no tautological category as decentering was required for a comparison of intentions.

Circumstantial Categories 2. Thematic and Technical Comparisons of Intentions.

2i. Narrative Themes:

a) **disagreement** with an analogous theme, through projection of an alternative theme (Kandinsky: *jungle* L.C.S. j7);

2ii. Psychological Themes:

a) **disagreement** with an emotive theme, through projection of an alternative emotion (Bellini: *happy* E.C.S. j11; Mondrian: *nice not boring* L.C.S. m8; *to show his feelings* F.O.S. m11);

b) **agreement**: confirming an emotive theme (Matisse: *happy* m7);

2iii. Technical Functions

a) **disagreement** based on projection of an alternative function (Mondrian: *picture not photo frame* j3);

b) **agreement** with artist's preference (Bellini: *interest* L.C.S. m5; Matisse: drawing for comprehension of emotions, E.C.S. j8; display, L.C.S. j5)

c) **uncertain: agreement** confirming detail and display (Hogarth: L.C.S. m12);

2iv. Time Comparisons: no example.

Theoretical categories: 3. Thematic and Technical Comparisons of Intentions.

3i. Narrative Themes.

a) **disagreement** based on an alternative theme (Kandinsky: *a theme I can't imagine* F.O.S. u1);

c) **uncertain: disagreement** based on an alternative projected theme (Hogarth: L.C.S. m4).

3ii. Psychological Themes:

a) **agreement** with contrasting emotions based on stages of emotive depiction; (Matisse: F.O.S. u7);

b) **disagreement** based a more important theme than status (Hogarth: L.C.S. m6) or an alternative emotive idea (Mondrian: F.O.S. m9).

4iii. Technical Functions.

a) **agreement**, through lack of an ideal style (Hogarth: L. .C.S. m1).

3iv. Hypothetical Argument: Relative agreement- disagreement, based on the artist's viewpoint (Manet: E.C.S. m3).

3v. Historical Generalisation: no examples.

The operational categories for the ability to compare own response with the artist's intention are shown in Appendix XI, Figure 64. There were two higher level borderline cases that were rated as F.O. for reference to *stages* (F.O.S. u7) contextual style (F.O.S. u6). All but eleven subjects were able to compare projected intentions. The eleven negative responses included the six negative

intentional responses (E.C.S. j4, j6, j10, j12; L.C.S. m10; F.O.S. m2), three no responses (E.C.S. j1; F.O.S. u3, u4), one unsupported agreement (L.C.S. j9), one vacuous response (*don't know because its such a good painting* E.C.S. j2). It was assumed that the five further negative responses were due to an inability to compare projected intentions.

Subjects used comparisons of intentions to determine agreement (E.C.S. j8, m3; L.C.S. j5, m1 m5; F.O.S. m7, u6, u7, including one uncertain subject (L.C.S. m12) and disagreement (E.C.S. j3, j11; L.C.S. j7, m8; F.O.S. m11, u1, u3, u5, including three uncertain subjects (L.C.S. m4, m6; F.O.S. m9). Agreements were confirmed through evidence of similar viewpoints for themes and processes for techniques. There was one thematic agreement , based on a psychological association with the artist's emotive intention (Matisse: happy L.C. S. m7). There were eight technical agreements. Four technical agreements were based on literal associations (Hogarth: detail and display, L.C.S. m12; Bellini: *historical painting*, F.O.S. u6; Matisse: display L.C.S. j5; Manet: relative agreement for drawing according to the artist's thematic viewpoint, E.C.S. m3). Four technical agreements were based on psychological associations (Hogarth: the artist's rejection of an alternative *perfect* style of painting, L.C.S. m1; Bellini: *interest*, F.O.S. u5; Matisse: emotive drawing or construction, E.C.S. j8; F.O.S. u7).

Disagreements were supported by evidence of alternative viewpoints for themes, and processes for techniques. There were ten thematic disagreements. Two thematic disagreements were based on literal associations (Hogarth: *another*

theme, L.C.S. m4; Kandinsky: an alternative analogous theme (*jungle*) L.C.S. j7).

Eight thematic disagreements were based on psychological associations with alternative feelings or reasons (Manet: F.O.S. u5; Bellini: E.C.S. j11; Mondrian: L.C.S. m8; F.O.S. m9, m11, u2) *a more important theme* (Hogarth: L.C.S. m6) and a theme not imagined by the subject (Kandinsky: F.O.S. u1). There was one technical disagreement based on a literal association with an alternative function (Mondrian: *picture not a photo-frame* E.C.S. j3).

In general agreements tended to focus on thematic intentions and disagreements on technical intentions. Disagreements also provided more alternative examples. Uncertain responses tended to involve disagreement. In relation to the three art functions thematic and technical agreement or disagreements were given for Utilitarian and Expressive functions. However, Formalist functions focused on thematic disagreements. The categories for two operational levels indicated that this ability had a higher level bipart structure. However, the projected measure needed to include agreement and disagreement.

6.2.5.1.5. The Ability to Identify Difficulties in Comprehending the Visual Evidence.

Data analysis indicated that identifying difficulties in thematic and technical comprehension, could be assessed according to the complexity of the literal and psychological associations. The following pre-specified operational categories for

assessing the thematic and technical difficulties identified were derived from data analysis.

Circumstantial Categories: 2. Complex Thematic and Technical Difficulties.

2i. Narrative Themes. Hogarth: recognition of items and actions (L.C.S. m1, m12); Mondrian: *nothing there* (F.O.S. u3); Kandinsky: ambiguity of analogous decoding of formal elements (L.C.S. j7).

2ii. Psychological Themes. Hogarth, Matisse: the resolution of the meaning of opposite emotions (L.C.S. m6. *people*; F.O.S. u7. *face*); Confirmation of the theme (*party*) by decoding order and emotions (Hogarth: L.C.S. m4);

2iii. Technical Functions. Manet: discordance of drawn subject matter (L.C.S. m3); Matisse: the use of unclear (E.C.S. j1) unrealistic colour (F.O.S. m2); the movement of brushstrokes (E.C.S. j8). Bellhi: unnatural colour on the face (E.C.S. j11); Mondrian: location of items, (E.C.S. j3; L.C.S. m1);

2iv. Time Comparisons: no examples.

Theoretical Categories: 3. Technical and Thematic Difficulties.

3i. Narrative Themes. Mondrian : identification of realistic meaning (L.C.S. *not recognisable* m8; F.O.S. no clues u2).

3ii. Psychological Themes. Manet: the reason *he did it* (F.O.S. u5) Kandinsky: identification of non realistic themes (F.O.S. *dreams*, u1);

3iii. Technical functions: no examples.

3iv. Hypothetical Argument: no examples..

3v. Historical Generalisations: no examples.

The operational categories and responses are shown in Appendix XI Figure 65.

There were three lower level borderline cases, that were rated as L.C.O. for comparisons with reality (*like*, E.C.S. j3, j11) and reference to lack of knowledge (L.C.S. m4). One subject (Hogarth: L.C.S. m4) who confirmed the thematic decoding with a psychological association was rated as L.C.O. All but fourteen subjects (E.C.S. j2, j4, j5, j6, j10, j12; L.C.S. j9, m4, m5, m10; F.O.S. m7, m11, u4, u6) identified difficulties, although there was one confirmation of comprehension (L.C.S. m4). It was assumed that the six negative responses from the E.C.S. were due to an inability to decentre to monitor their comprehension. It was assumed that the eight responses from the two higher level samples were due to an acceptance of their understanding.

There was evidence that the identification of thematic and technical difficulties involved a literal/narrative, psychological and technical decoding of visual cues. Thematic difficulties were related to narrative and psychological comprehension. Narrative difficulties involved recognition of; items and actions (Hogarth: L.C.S. m1, m12), the ambiguity of analogous decoding (Kandinsky L.C.S. j7), the realistic meaning of formal elements (Kandinsky /Mondrian: F.O.S. u3; L.C.S. m8). Psychological difficulties involved affective decoding (Hogarth, Matisse: the resolution of the meaning of opposite emotions L.C.S. m6; F.O.S. u7; Kandinsky: the non-realistic decoding of dreams F.O.S. u1) and decoding reasons (Manet: F.O.S. u5). Thematic decoding included five literal (L.C.S. j7, m1, m8, m12; F.O.S. u3) and four psychological associations (L.C.S. m6; F.O.S. u1, u5, u7).

Technical difficulties were related to the comprehension of technical processes (Manet: the discordant drawing of items E.C.S. m3; Bellini, Matisse: the use of colour E.C.S. j1, lack of clarity E.C.S. j8, 11; F.O.S. m2) and reasons for the location of formal elements (Mondrian: E.C.S. j3; F.O.S. m9). Technical decoding included six literal associations (E.C.S. j1, j3, j8, j11, m3; F.O.S. m9) and one psychological associations (F.O.S. m2. *strange*).

In general the thematic and technical difficulties were identified through comparisons with reality, which indicated the need for a stylistic comprehension of artworks. In relation to art functions subjects identified thematic and technical difficulties for all three art functions. The categories for two operational

levels indicated that this ability had a higher level bipart structure. However, the projected measure needed to include the confirmation of understanding.

6.2.5.1.6.. Summary of the Testing of the Tripart Structure of the Intentional Abilities.

Data analysis indicated, that the intentional abilities could be incorporated with the assessment of the visual abilities, for three art functions. Intentional judgements were determined by perceptions of the function of the artwork.

Thematic and technical intentions could be related to items, actions and motives and assessed according to the complexity of literal and psychological associations.

6.2.5.2. The Tripart Structure of the Historical Abilities.

Data analysis indicated that the stylistic and the historical abilities, including contemporary criticism referred to thematic and technical contexts, which could be assessed according to the complexity of the literal and psychological associations with time. Therefore, the pre-specified operational categories for assessing thematic and technical functions were adapted to assess thematic and technical contexts. However, pre-requisite naming and dating required separate assessment procedures.

6.2.5.2.1. Data Analysis of the Stylistic Abilities.

Data analysis of the tripartite structure, was undertaken for five stylistic abilities which were given separate data analyses.

6.2.5.2.1.1. The Ability to Name the Artist.

The naming of the artist for stylistic and historical analysis, involved implicit stylistic differentiation. Therefore, implicit associations were assessed according to the complexity of the literal associations with the artist's name or nationality.

The following operational categories were derived from data analysis of the naming of one or more artists for six artworks: Hogarth, Manet, Bellini, Matisse, Kandinsky, Mondrian.

Circumstantial Categories: 2. Complex Contextual Associations.

2i. Decoding the artist:

a) by name: *Monet*: E.C.S. m3; L.C.S. m8; with *Claude* F.O.S. u7; *Van Gogh*: L.C.S. m4; *Picasso*: F.O.S. m2. m9; *Titian*: L.C.S. m10; *Manet-Cezanne-Goya*: F.O.S. u4.

b) by nationality: *French*: F.O.S. m11; *English*: F.O.S. m4;

Theoretical Categories: 3. Contextual Associations.

3i. Decoding the artist's name through stylistic movements: F.O.S. u1. *Surrealism* for Kandinsky; ; u7. *Cubism* for Mondrian, with *old type painting* for Hogarth/Manet.

The operational categories and responses for the ability to name the artist are shown in Appendix XI, Figure 66. Any reference to a well known artist or style was rated. References to the artist's name or nationality required a physical generalisation of the contents and were rated as L.C.O. References to several artist's required multiple retention, but were rated as L.C.O. References to art styles required an abstract generalisation and were rated as F.O. Fourteen subjects named an artist, including two references to most of the artists (F.O.S. u4, u7).

There was one vacuous irrelevant guess (L.C.S. j5. *James Robinson*). There were seventeen negative responses (all but m3, from the E.C.S.; L.C.S. j9, m1, m5, m6, m12; F.O.S. m7, u3, u7). It was assumed that the eighteen void responses were

due to lack of information, although younger subjects could lack decentering to relate the artist's name to visual cues.

No subjects gave the correct name of the artist. Three subjects made good guesses (L.C.S. m10. *Titian* for Bellini; F.O.S. u4, u5. *Goya* for Manta). Eight subjects made close guesses: *Mount* (E.C.S. m3; L.C.S. m8) *Van Goth* (F.O.S. m2; *Toulouse Latter* (F.O.S. u2) *Cozen* (F.O.S. u4) for Matisse: *Picasso* for Mondrian (F.O.S. m2, m9) and Kandinsky (L.C.S. j7). One subject made a random guess (*Claude, Monet* for Mondrian F.O.S. u7). Two subjects referred to the artist through the nationality (*English* for Hogarth , F.O.S. u4; *French* for Mondrian, F.O.S. u7). Two subjects referred to the artist through the style of the artworks (F.O.S. u1. *Surrealism* for Kandinsky; u7. *Cubism* for Mondrian, with *old type paintings* for Hogarth/Manet), All but two subjects identified modern artists (L.C.S. m10. *Titian*; F.O.S. u7. *Claude*). All of the associations for naming, were literal, apart from two psychological stylistic associations (*Surrealism*, u1, u7). The naming of the artist involved implicit dating through the artist's lifespan, national context or style. The categories for two operational levels, indicated that the ability to name the artist had a higher level bipart structure.

6.2.5.2.1.2. The Ability to Infer the Country of Origin.

Data analysis indicated that separate assessments were required for naming the country and giving thematic and technical reasons for inferring the country of origin. Data analysis indicated that naming the country of origin could be assessed

through the complexity of the implicit associations with distance. The following operational categories were derived from data analysis of the countries named for three artworks by Leonardo, Seurat, Chagall.

Tautological Categories: 1. Simple Contextual Associations.

1i. Decoding the indigenous country and capitals:

a) Leonardo: *England* E.C.S. j1; j10; j11; F.O.S. u7;

b) Seurat *England*: E.C.S. j1; m3; L.C.S. j9, m1; F.O.S. m7, m9, m11, *London*: E.C.S. j2; *Scotland* E.C.S. j1.

c) Chagall: *England* E.C.S. j6; with *anywhere*: F.O.S. u1.

1ii. Decoding the physical location. Seurat: *a hot country* (E.C.S. j12); Chagall: *country with farms* (F.O.S. u6).

Circumstantial Categories: 2. Complex Contextual Associations.

2i. Indigenous generalisation, or age comparison. Seurat: *Britain*, F.O.S. u5; *old England picture*, L.C.S. m10

2ii. Decoding European or Mediterranean Countries and Capitals.

a) Leonardo: *Italy*, E.C.S. m3; F.O.S. m9, u1, u2, u3; *Rome*, L.C.S. m12; *Egypt*, j8; *Israel*, F.O.S. m11; *Jerusalem*, E.C.S. j2;

b) Seurat: *France*, L.C.S. m12; F.O.S. m2, u1, u2 (with *England*), u3, u4, u7;

c) Chagall: *France*: E.C.S. m3; with *Britain*, F.O.S. u5; *Germany*, E.C.S. j2; L.C.S. j7, j9, *Holland*, L.C.S. m10.

2iii. Decoding Continents:

a) Leonardo: *Africa*, L.C.S. j9.

b) Seurat: *Australia*, E.C.S. j6; *America*, L.C.S. j7.

c) Chagall: *Australia*, E.C.S. j8, *America*, F.O.S. u2, u3, with *China*, E.C.S. j11; *Russia*: m8; *Europe*, F.O.S. u7.

2iv. Decoding by Nationality.

a) Leonardo: *Where does Michel-Angelo come from?* L.C.S. j7.

Theoretical Categories: 3. Contextual Associations.

3i. Abstract generalisations for countries.

a) Leonardo: *Scandinavia*, F.O.S. u5.

b) Seurat: no examples.

c) Chagall: *a developing country*, F.O.S. m11.

The raw data for each operational sample for three artworks, are shown in

Appendix XI, Figure 67. There was one borderline lower-level case, that was rated

at L.C.O. for a complex comparison (Leonardo: L.C.S m10, *an old England*

picture). All references to countries were given a combined operational rating

according to the highest level of response for three artworks, as shown in

Appendix VII. All but five subjects were able to name a country of origin (E.C.S j3, j4; L.C.S. j5, m4, m5). Thirteen subjects named a country of origin for all three artworks (E.C.S. j2, j8, m3; L.C.S. j9, m6, m8; F.O.S. m11, u1, u2, u3, u4, u5, u7). Thirteen subjects named the country of origin for two (E.C.S. j1, j6, j11; L.C.S. j7, m1, m10, m12; F.O.S. m7, u6), or one artwork (E.C.S. j10, j12; F.O.S. m7, u6). It was assumed that the five negative responses for all three artworks, and the thirteen negative responses for one or two artworks, were due to limited geographical concepts.

Geographical associations for the three artworks were made with:

- a) the indigenous country: (E.C.S. j1, j2, j11, m3; L.C.S. j9, m8; F.O.S. m7, m9, m11, u5, u7) including age comparisons (*old English picture*) and generalisations (*Britain*: u5);
- b) the physical location (*hot*, E.C.S. j12; *farm*, F.O.S. u6)
- c) countries and continents. (E.C. S. j2, j6, j8, j11, m3; L.C.S. j7, j9, m6, m1, m8, m12; F.O.S. m2, m9, m11, u1, u2, u3, u7);
- d) generalised countries or location (F.O.S. *developing country*, m11 *Scandinavia*, u5);
- e) the artist's nationality (L.C.S. j7).

All of the geographical associations were literal, apart from a psychological association with a *developing country* (F.O.S. m11).

Data analysis indicated that the thematic and technical reasons given to support the country of origin, could be assessed according to the complexity of the literal

and psychological associations with the geographical context. The following thematic and technical operational categories were derived from data analysis of the reasons for naming the country of origin for three artworks.

Tautological Categories: 1. Simple Geographic Associations.

1i. The thematic context through corresponding items, actions and physical location. Leonardo: E.C.S. j1. *clothes*; j2. *we don't have mountains* L.C.S. j9. *trees and mountains*; Seurat: E.C.S. j12. *on the beach*; L.C.S. j9. *trees*; m10. *way people going round* ;Chagall: E.C.S. j6. *the clothes* ; F.O.S. u6. *cow, sheep or something*;

1ii. The technical context: no examples.

1iii. Assertion: Leonardo: F.O.S. u3.

Circumstantial Categories: 2. Complex Geographic Associations.

2i. The thematic context through: corresponding:

a) items, actions, physical location: Leonardo: E.C.S. j8. *looks like hot country* ; F.O.S. m11, u5. *background rocky mountains* Seurat: E.C.S. j6. *when there were wearing the same things* ; j8. *USA sunny and green grass* ; L.C.S. m1. *they like an English park or place* : m6. *rich people laid back on a sunny afternoon* ; F.O.S. m7. *way dressed, what wearing* ; u1. *top-hat* ; Chagall: E.C.S. j8. *in Australia lots of the same things* ; L.C.S. m8. *walking* ; m10. *open countryside in Holland* ; F.O.S. m11. *only see parks in England, not on holiday* ; u1. *houses in the background* ; u3. *lake Geneva, and way dressed* ;

c) comparisons with reality. Leonardo: E.C.S. j11. *looks real* ; Seurat: E.C.S. j2. *saw it on television* ;

d) time comparisons: actions: Seurat: F.O.S. m9. *what people did in those days, bustles and sailing*.

2ii The Technical context through correspondence with:

a) the artist's nationality. Leonardo: L.C.S. j7; F.O.S. m2; Seurat: F.O.S. u4; Chagall: L.C.S. j7; .

b) the stylistic nationality. Seurat: L.C.S. j7. *all points and its modern so America*, Chagall: E.C.S. j2. *Germans are artistic* ; F.O.S. u4. *looks Spanish*;

c) time comparisons: simple style: Leonardo: L.C.S. m8. *like paintings in old houses*.

Theoretical Categories: 3. Geographical Associations.

3i. The thematic context through corresponding:

a) style of items: Seurat: F.O.S. u2. u7. *French fashion or styles*; Chagall: F.O.S. u2. *style of buildings in USA*

b) events: Chagall: F.O.S. u7. *rebellion against the church* ;

c) generalised or ambiguous physical location: Leonardo: L.C.S. m6. *scenery* ; F.O.S. u7. *our heritage* ; Seurat: F.O.S. u5. *typically English countryside*; Chagall: F.O.S. m11. *developing country*; u5. *implicit ambiguity of locating a fantasy theme*.

d) historical time: Seurat: L.C.S. m8. *clothes look Victorian*;

3ii. The technical context through correspondence with:

a) famous artist's nationality: Leonardo: E.C.S. m3.

b) stylistic nationality: Leonardo: L.C.S. m1: *French painting scenery not English*; m12. *painting style in Rome*; F.O.S. m9. *style and clothes*; u2. *where style of Italian artists*; Seurat: E.C.S. m3. *English painting not normal or active* L.C.S. m12. *style* ; Chagall: E.C.S. j11. *do fantasy drawings with Japan for old pictures*; E.C.S. m3. *French style painting*;
 c) stylistic historical context: Leonardo: F.O.S. u1, u4. *from the Renaissance*.

The operational categories and responses are shown in Appendix XI, separately for Leonardo (Figure 68) Seurat (Figure 69) Chagall (Figure 70). There were two lower level borderline cases that were rated as L.C.O. for references to *Australia* (Seurat: E.C.S. j8) and to actions (Seurat : L.C.S m8). There were four higher level borderline cases that were rated as F.O.(for Leonardo: *scenery* L.C.S. m1, m6 ; Seurat: E.C.S. m3. *active*; F.O.S. u5, *typical*). One assertion was rated as E.C.O. (Leonardo: u3. *thought it was*). A combined rating was given of the reasons for the country of origin, according to the highest level of response, as shown in Appendix VII. All but six subjects were able to give one, two or three reasons for inferring the country of origin for three artworks. However, three subjects gave less reasons than names (F.O.S. m2: not Seurat; L.C.S. j9, F.O.S. u3: not Chagall), and one subject changed the name to Geneva (Seurat: F.O.S. u3). The six negative responses included the five subjects who were unable to name a country, and one further subject who failed to give reasons for one named artwork (Leonardo: E.C.S. j10). It was assumed that negative responses were due to limited geographical concepts. All but three of the reasons were based on similarities (Leonardo: E.C.S. j2; L. C.S. m1, Seurat: ; F.O.S. m11). The collective thematic and technical reasons that subjects gave for countries of origin, were given separate data analyses.

Thematic reasons for the country of origin were given by:

- i. nine subjects for Leonardo's artwork (E.C.S. j1, j2, j8, j11, j12; L.C.S. j9, m6, u5, u7);
- ii. seventeen subjects for Seurat's artwork (E.C.S. j1, j2, j6, j8, j12; L.C.S. j9, m1, m6, m8, m10; F.O.S. m7, m11, u1, u2, u3, u5, u7);
- iii. Eleven subjects for Chagall's artwork (E.C.S: j6, j8, m6, m8, m10; F.O.S. m11, u1, u2, u5, u6, u7).

The majority of subjects made implicit or explicit literal thematic associations with countries through;

- a) items or actions (Leonardo: E.C.S. j1; Seurat: E.C.S. j6; L.C.S. j9, m10; F.O.S. m7, u1; Chagall (E.C.S. j6, j8; L.C.S. m8; F.O.S. u6) including the style if items (Seurat: F.O.S. u2, u7; Chagall: F.O.S. u7).
- b) the physical location (Leonardo: E.C.S. j2, j8; L.C.S. j9, m6; F.O.S. u5, u7; Chagall: L.C.S. m6; m10; F.O.S. u1, u2) and the ambiguity of locating a fantasy theme F.O.S. u5);
- c) comparisons with reality: Leonardo: E.C.S. j11; Seurat: E.C.S. j2;
- d) associations with the historical context: Seurat: L.C.S. m8; F.O.S. m9.

Four subjects made psychological thematic associations with the subject matter (Leonardo: F.O.S. u7 *our. heritage*; Seurat: L.C.S. m6. *rich and laid back*; Chagall: F.O.S. m11. *developing*; u5. *fantasy*; u7. *rebellion*).

Only five of the thirty seven thematic geographic inferences identified the correct thematic location (Seurat: *France*, F.O.S. u1; Leonardo: E.C.S. j2. *Jerusalem*, j8. *Egypt*; F.O. S. m11. *Israel*; Chagall: L.C.S. m8. *Russia*). However, only one of

these corresponded with the country of origin (France, F.O.S. u1), due to differences between the thematic location and the context of production. It was assumed that the ambiguity of thematic associations resulted in poor correspondences with the country of origin. Ambiguities were indicated by an incorrect change of location (Seurat: *France to Switzerland* F.O.S. u3) and a reference to visual ambiguity (Chagall: F.O.S. u7).

Technical reasons for the country of origin were given by:

- i. ten subjects for Leonardo's artwork (E.C.S. m3; L.C.S. j7, m1, m8, m12; F.O.S. m2, m8, u1, u2, u4).
- ii. four for Seurat's artwork (E.C.S. m3; L.C.S. j7, m12; F. O.S. u5);
- iii. five for Chagall's artwork (E.C.S. j2. j11, m3 ; L.C.S. j7; F.O.S. u4).

The majority of subjects made literal technical associations with the country of origin through:

- a) the artist's nationality (Leonardo: L.C.S. j7; F.O.S. m2; Seurat: L.C.S. j7; F.O.S. u4);
- b) the stylistic nationality (Leonardo: E.C.S. m1; m9; m12; F.O.S. u2; Seurat: L.C.S. m12, j7; Chagall: E.C.S. j2. m3. and an assertion, F.O.S. u4)
- c) the historical context: Leonardo: L.C.S. m8. *paintings in old houses*;

Psychological technical associations were made by four subjects with the nationality of: famous artists (Leonardo: E.C.S. m3); styles (Seurat: E.C S. m3. *English painting not normal* ; Chagall: E.C.S. j11. *fantasy*) and the historical context (Leonardo: F.O.S. u1, u4. *Renaissance*).

Only eight of the nineteen technical associations inferred the correct geographic context (Leonardo: L.C.S. m12; F.O.S. m2, m9, u1, u2, u4; Seurat: L.C.S. m12; F.O.S. u4). However, independent technical associations with artist's nationalities and styles were more likely to be correct than thematic associations, which could be ambiguous.

The categories for three operational levels indicated that this ability had a tripart structure. However, there was evidence that technical geographical associations required circumstantial levels of thinking.

6.2.5.1.3. The Ability to Infer the Date of an Artwork.

Data analysis indicated that time associations for dating and giving reasons required separate assessments. Inferring the date from the visual cues, was assessed through the complexity of the time scale involved. Time associations could be literal or psychological. The following operational assessment categories, were derived from data analysis of the methods of dating three artworks (Leonardo, Seurat, Chagall).

Tautological Categories: 1. Simple Time Associations.

- 1i. Decoding time in years (E.C.S. all artworks: j6; Chagall : j10) or parts of years (all artworks: L.C.S. j5).
- 1ii. Decoding time as length (E.C.S. Leonardo-Chagall: j8; Leonardo: u2) or amount (E.C.S. Seurat-Chagall: j11).

Circumstantial Categories: 2. Complex Time Associations.

- 2i. Ranking in years: all artworks: u1; Seurat: j10; or time comparisons (Seurat: E.C.S. j8. *like*)
- 2ii. Decoding time in hundreds of years e.g. 1920. (all artworks: E.C.S. j2, m3; L.C.S. j9, m1, m12; F.O.S. m7, u2, u7; Leonardo: F.O.S. u4; Leonardo-Seurat: L.C.S. m4. Seurat: E.C.S. j12; Seurat-Chagall: L.C.S. m8; Chagall: m10).

Theoretical Categories: 3. Time Associations.

3i. Decoding Centuries: all three artworks: L.C.S. j7, m5; F.O.S. m9, m11; Leonardo-Seurat: L.C.S. m10 Seurat: u4; Seurat-Chagall: F.O.S. u7; Chagall: L.C.S. m4, m10; F.O.S. m2; u5).

3ii. Generalised Historical Periods: the *Renaissance* (Leonardo: F.O.S. m2,u3,u6); *Victorian* (Leonardo: L.C.S. m6, m8; Seurat: F.O.S. u6) *Modern* (Chagall: u6).

The dates inferred by three operational samples, for three artworks are shown in Appendix XI, Figure 71 . The dating of the three artworks was given a combined rating, according to the most complex time association, as shown in Appendix VII. The combined rating accommodated subjects who used mixed methods of dating. There were four borderline lower level cases that were rated as L.C.O. for time comparisons (E.C.S. j8) and use of ranking (E.C.S. j10. *about*; F.O.S. u1: *least, less, last*; u4. *last*). All but three subjects could date the artworks (E.C.S. j1, j3, j4). Three further subjects failed to date one artwork (Leonardo: E.C.S. j10; Chagall: E.C.S. j11; F.O.S. u6) and one subject failed to date two artworks (F.O.S. u3. Seurat and Chagall). It was assumed that, negative responses for younger subjects indicated limited time scales and for older subjects lack of knowledge of historical generalisations.

Nine subjects ranked the dates in time e.g. *early, late, beginning, middle* (E.C.S. j10; L.C.S. m6; F.O.S. m2, m7, m9, u1, u4, u5, u7). Subjects used increasingly complex time scales to date artworks. Limited time scales based on length, amount or a year provided the least accurate inferences. (all artworks: E.C.S. j6, j8, j10, j11; Leonardo: F.O.S. u2; Seurat: E.C.S. j12; L.C.S. j5, m6; Chagall: F.O.S. u1, u4). This was assumed to be due to limited time concepts. More advanced time

scales based on hundreds of years, centuries and historical periods provided greater accuracy because of the greater margin for error e.g.

a) Leonardo: nine of the eighteen inferences (E.C.S. j2; L.C.S. j7, m5, m10; F.O.S. m2, m9, u3, u5, u6, u7);

b) Seurat: thirteen of the twenty-one inferences (E.C.S. j2, m3; L.C.S. j9, m1, m5, m6, m12; F.O.S m9, u2, u4, u5, u6, u7);

c) Chagall : ten of the seventeen inferences (L.C.S. m3; L.C.S. j7, m1, m4, m5; F.O.S. m2, m11, u2, u5, u7).

In addition three subjects transferred an English time scale (*Victorian*) to Italian (Leonardo: L.C.S. m6. m8) and French (Seurat: F.O.S. u7) contexts. The majority of time associations were literal, apart from four psychological associations with the *Renaissance* (F.O.S. m2, u3, u6) and *modern* (F.O.S. u6).

Data analysis indicated that thematic and technical reasons for dating, could be assessed according to the complexity of the literal and psychological associations with time. The following thematic and technical contextual operational categories, were derived from data analysis.

Tautological Categories: 1. Simple Contextual Associations

1i. Thematic time associations with items:

a) explicitly with age (*old* , Leonardo: E.C.S. , j2; Chagall: E.C.S. j12); i) implicitly (*clothes and things*, Leonardo: E.C.S. j11; Seurat: L.C.S. j9, m10; F.O.S. u6; Chagall: L.C.S. j9;

1ii. Technical time associations with formal elements;

a) explicitly with time as age (Leonardo: E.C.S. j6); b) implicitly (Chagall: E.C.S. *colourful*, j2; *brighter*, j6; *paints different*, j10).

1iii. Assertions: Seurat: *looks new*: E.C.S. j12.

Circumstantial Categories: 2. Complex Contextual Associations.

2i Thematic time associated :

a) explicitly with items and actions

i) age (Leonardo: j8; L.C. S. *picture looks old, and feet*, j9; Seurat: *older umbrella* , j6);

- ii) things now/ not now or today (Seurat: L.C.S. j8; Chagall: E.C.S. j8; F.O.S. m9, u5); actions not before that time (Chagall: F.O.S. u4);
- b) implicitly with items and actions:
(Seurat: E.C.S. *top hat*, j2; *monkey*, j11; F.O.S. *type of thing wearing* m2; *clothes in picture*, u2; Chagall: F.O.S. *equipment for harvest*, m7; *milking cows*, m11);
- c) explicitly with the physical location (Leonardo: *in olden days with people near forests*, L.C.S. m4).
- d) with thematic rules: (Leonardo: *a portrait*, L.C.S. m6).
- 2ii. Technical time associations:
 - a) with the technical process:
 - i) explicitly with time of happening (Leonardo: L.C.S. j5) with the length time painted (Seurat: L.C.S. j5) and *not done in early times* (Chagall: L.C.S. m6);
 - ii) implicitly: *how made, way done* (Leonardo: m5; Seurat: L.C.S. m5; Chagall: E.C.S. m3; L.C.S. m5; F.O.S. u1);
 - b) with the technical rules i. explicitly: (Chagall: *lively, imaginative, could be done before 1900*, L.C.S. m4);
 - ii) implicitly: (Leonardo: *plain images*, L.C.S. m1; Seurat: *made up of pins*, L.C.S. j7; Chagall: *careful colouring*, L.C.S. j5);
 - c) with similar styles of painting:
 - i.) explicitly (Leonard: *at that time*, F.O.S. u4);
 - ii) implicitly (Leonardo: *paintings that look like that*, L.C.S. m12; *artist's painted like this*, F.O.S. u6; Chagall/ Seurat: *fits in the middle* F.O.S. u4; *similar at home*, L.C.S. m8);
- 2.iii. Comparative assertion: Leonardo; E.C.S. j8. *picture looks really old*.

Theoretical Categories: 3. Contextual Associations.

3i. Thematic time associations with the style of

- a) items (Seurat: Victorian clothes, L.C.S. m1, m4; fashion and way things built, L.C.S. m9; dress of period, F.O.S. u1; inventions e.g. *steam boat* F.O.S. m7).
- b) the physical location (Leonardo: *old fashioned country side*, L.C.S. m10); c) themes and thematic rules (Leonardo: *Victorian times* L.C.S. m8; F.O.S. m11. similar moods for a religious picture, Seurat: *not typical modern day*, F.O.S. m11; Chagall: *strange fantasy world*, L.C.S. j7);

3ii. Technical time associations with style for:

- a) processes, including items (Leonardo: drawing and the style of the dress, L.C.S. m7; Seurat: painting, clothes, and way things built, F.O.S. m9; Chagall: painting style, F.O.S. u2. u7); b) technical rules (Leonardo and Seurat: *normal not bright*, E.C.S. m3; *old style, not revolutionary*, F.O.S. u7; Chagall: L.C.S. *modern not anything in particular*, m1; *modern, fragmented and varied*, m10; F.O.S. *modern mood with cave painting*, m2);
- c) stylistic movements: (Seurat: F.O.S. *Impressionism*, u5; the artist's development from *Pointillism* to *Impressionism*, u7);
- d) historical context:
 - i) time painted (Seurat: *when made*, L.C.S. m6);
 - ii) similar historical artworks (Leonardo: L.C.S. j7. *date in museum*, F.O.S. , amount of pictures with similar items m9; Renaissance style, u1, for religious painting, u2; *from art history*, u5);
 - iii) critical context (Chagall-Seurat: relative change in views on art and processes, L.C.S. m12).

The operational categories and responses for the ability to give reasons for dating, are shown separately in Appendix XI, for Leonardo (Figure 72), Seurat,(Figure 73) Chagall (Figure 74). There were three borderline lower level cases. One was rated as E.C.O. for *looks new* (Seurat: E.C.S. j12) and two as L.C.O. for complex comparisons (Leonardo: *really old picture*, E.C.S. j8; L.C.S. j9). There were twelve higher level borderline cases, which were rated as F.O. for references to moods (Leonardo: F.O.S. m11; Chagall: F.O.S. m2), *art history* (Leonardo: F.O.S. u5), *style* (Leonardo: F.O.S. m7, u1, u2; Leonardo and Seurat: E.C.S. m3; Leonardo and Chagall: F.O.S. u2, u7), contextual dating (Chagall: L.C.S. m6; F.O.S. u4) and relative critical rules, (Seurat-Chagall: L.C.S. m12). The responses for the three artworks were given a combined rating as shown in Appendix VII.

All but four of the subjects were able to give reasons for dating an artwork. The negative responses included the subjects who were unable to date artworks (E.C.S. j1, j3, j4) and one further subject who failed to give a reason for the only dated artwork. (F.O.S. u3). In addition, five of the twenty- seven subjects failed to give reasons for one of the previously dated artworks (E.C.S. Chagall: j1; Seurat: j10; Leonardo: j12; L.C.S. Seurat: m8; F.O.S. Leonardo: m2). It was assumed, that the inability to give reasons for dating was due to limited time concepts. Separate data analyses were given for thematic and technical reasons, although two ambiguous assertions were excluded (Seurat: E.C.S. j12. *looks new* ; Leonardo: L.C.S. j9. *old picture*).

Data analysis of thematic reasons which associated time with the subject matter were made by:

- i. eight subjects for Leonardo's artwork (E.C.S. j2, , j11; L.C.S. j9, m4, m6, m8, m10; F.O.S. m11,);
- ii. fifteen subjects for Seurat's artwork (E.C.S. j2, j6, j8, j11; L.C.S. j9, m1, m4, m10; F.O.S. m2, m7, m9 m11, u1, u2, u6);
- iii. nine subjects for Chagall's artwork (E.C.S. j8, j12; L.C.S. j7, j9; F.O.S. m7, m9, m11, u4, u5).

The majority of thematic time associations were literal. These included:

- a) implicit and explicit association with reality, items, actions or the physical location: (Leonardo: E.C.S. j2, j11; L.C.S. j9, m4; Seurat: E.C.S. j1, j2, j6, j8; L.C.S. j9, m10; F.O.S. m2, u2; Chagall: E.C.S. j8, j11; L.C.S. j0; F.O.S. m7, m9, m11. u1, u4 u5); b) the style of items (Seurat: L.C.S. m1, m4; F.O.S. m7);
- c) implicitly with thematic rules (Leonardo: *portrait*, L.C.S. m6;
- d) the historical context (Leonardo: *Victorian*, L.C.S. m8.

There were five implicit-explicit psychological associations with time for:

- a) themes and thematic rules (Leonardo: F.O.S. m11. *moods*; Seurat: F.O.S. m11. *not a typically modern day*; Chagall: L.C.S. j7. *fantasy world*);
- b) fashion (Leonardo: for *countryside*; L.C.S. m10; Seurat: F.O.S. for *clothes*, m9).

Data analysis of technical reasons which associated time with the technical process were made by:

- i. sixteen subjects for Leonardo's artwork (E.C.S. j6, m3; L.C.S. j5, j7, m1, m5, m12; F.O.S. m7, m9, u1, u2, u3, u4, u5, u6, u7);
- ii. nine subjects for Seurat's artwork (E.C.S. m3; L.C.S. j5, j7, m5, m6, m12; F.O.S. u4, u5, u7);
- iii. sixteen subjects for Chagall's artwork (E.C.S. j2, j6, j10, m3; L.C.S. j5, m1, m4, m5, m6, m8, m10, m12; F.O.S. m2, u1, u2, u7).

The majority of technical time associations were literal. These included implicit and explicit associations with:

- a) the formal elements and media (Leonardo: E.C.S. j6; Chagall: E.C.S. j2, j6, j10); b) style as a technical process including items; (Leonardo: L.C.S. j5; m5; Seurat: L.C.S. j5, m5, m6; Chagall: E.C.S. m3; L.C.S. m5, m6; F.O.S. u1);
- c) technical rules: implicitly Seurat: L.C.S. j7;
- d) similar styles of painting (Leonardo: F.O.S. m9, u4; including in a museum, L.C.S. j7; Seurat: F.O.S. u4; Chagall: L.C.S. m8; F.O.S. m6).

Seven subjects made the following implicit and explicit psychological associations with time, through references to:

- a) style (Leonard: F.O.S. u7; Seurat: F.O.S. m9; Chagall: F.O.S. u2; u7) and stylistic movements (Seurat: Impressionism, F.O.S. u5, u7);
- b) technical rules (Leonardo: *normal*, E.C.S. m3; L.C.S. *plain*, m1; *not revolutionary*, F.O.S. m1; Chagall: *careful*, L.C.S. j5; *lively and imaginative*, L.C.S. m4; *modern*, L.C. S. m1, m10; *modern moods*, F.O.S. u2);
- c) the historical context (Leonardo; *Renaissance* F.O.S. m9; with religious painting, F.O.S. u2; *art history*, F.O.S. u5);
- d) relative change according to contextual views (Seurat/Chagall: L.C.S. m12).

Technical and thematic dating, involved associating stylistic similarities and some differences (items or processes) with time. Therefore dating required historical or stylistic knowledge for decoding visual cues. The categories for three operational levels indicated that this ability had a tripart structure. However, the projected measure needed to include psychological associations with time.

6.2.5.1.4. The Ability to Differentiate Between Present and Past Artworks.

The historical differentiation of artworks was assessed through the reasons given for dating present and past artworks. Reasons for present artworks were based on the selection of modern artworks from three examples (Leonardo, Seurat, Chagall), as shown in Figure 29. All but four subjects selected Chagall and/or Seurat as modern artworks. The remaining four subjects gave void responses (no response, E.C.S. j4; vacuous response, E.C.S. j2. Leonardo) or selected Leonardo with Seurat. (E.C.S. j8; L.C.S.: j5). Void responses were assumed to be due to a global fusion of time associations.

Reasons for past artworks were based on the subjects classification of the remaining artworks. However, due to the relativity of time the classification of present and past artworks could overlap i.e. Chagall and Seurat could be regarded as present artworks, and Leonardo and Seurat as past artworks. In addition Chagall was placed in the past classification by default (E.C.S. j6, j8; F.O.S. m7). The selection of modern artworks provided evidence of greater differentiation with maturity e.g. the E.C.S. included vacuous references to Leonardo; the L.C.S.

included more joint references (Seurat-Chagall); the F.O.S. included more references to Chagall.

FIGURE 29

THE MODERN ARTWORKS SELECTED BY THREE OPERATIONAL SAMPLES.

E.C.S.	L.C.S.	F.O.S
j1. Leonardo	j5. Leonardo	m2. Chagall
j2. Chagall	j7. Chagall/Seurat	m7. Seurat
j3. Chagall	j9. Chagall	m9. Chagall
j4. -	m1. Chagall/Seurat	m11. Chagall
j6. Leonardo/Seurat	m4. Seurat/Chagall	u1. Chagall
j8. Leonardo/Seurat	m5. Seurat	u2. Chagall/Seurat
j10. Seurat	m6. Seurat/Chagall	u3. Seurat/Chagall
j11. Seurat	m8. Seurat/Chagall	u4. Chagall
j12. Seurat	m10. Chagall	u5. Chagall/Seurat
m3. Chagall	m12. Chagall	u6. Chagall
		u7. Chagall

.....
E.C.S.= Early Concrete Sample. L.C.S.= Late Concrete Sample F.O.= Formal Operational Sample.

Data analysis indicated that subjects used similar thematic and technical reasons for differentiating between artworks, which could be assessed according to the complexity of literal and psychological associations with time. The following thematic and technical operational categories were derived from data analysis of the reasons given for the modern and the remaining (past) artworks.

Tautological Categories: 1. Simple Contextual Associations.

1i. Thematic time associated with items:

A) Modern: Seurat: *lots of people*, E.C.S. j12;

B) Past. Leonardo/Seurat: *old people colours clothes*, L.C.S. j9;

1ii. Technical time associations: no examples.

Circumstantial Categories: 2. Complex Contextual Associations.

2i. Thematic time associations:

a) with items, actions and physical location:

i) Modern: Seurat: *different from people today and umbrellas on a sunny day*, E.C.S. j11; *modern boat*, L.C.S. m6; *modern things like umbrellas and steam boats on the lake*, F.O.S. m7; *time of Mary Poppins*, F.O.S. m9; Chagall: *more like our houses than the others*, F.O.S. m11;

ii) **Past.** Leonardo: *could be old, by people*, L.C.S. m4; *older picture*, F.O.S. m7; Seurat: *quite old, women didn't wear long dresses and top hats*, E.C.S. j2; *unusual umbrellas in the light*, L.C.S. j5; Chagall: *looks old because of use of tools*. F.O.S. m7;

b) thematic rules:

i) **Modern:** Chagall L.C.S. m6. *more detailed clothes and stands out*.

ii) **Past:** Chagall: E.C.S. *interesting*, j6; *like make believe, things not real colour*, j8.

2ii. Technical time associations:

a) Process and technical rules:

i) **Modern:** Chagall: *way drawn, not plain and simple like the olden times*, E.C.S. m3; *something made up*, L.C.S. m4; *start of imaginative skills*, L.C.S. m12;

Chagall/Seurat: *block coloured*, F.O.S. u3; Seurat: *up to date*, Chagall: *can't tell what it is*, L.C.S. m5;

b) simple stylistic development: ranking in time:

i) **Modern:** Chagall: *last one hundred years*, F.O.S. u6;

ii. **Past:** Seurat *in-between*, Leonardo *quite late before Seurat*, (L.C.S. m6);

Seurat *in the middle sort of age*, Leonardo *quite early 1500*, (L.C.S. m10)

Leonardo *about 1820*, Seurat *somewhere 1900* (L.C.S. m12) Seurat: *could be Monet*.(F.O.S. u1).

2iii. Modern assertions. Chagall: E.C.S. j2. *looks modern*; Seurat/Chagall: L.C.S. m1. *fairly modern*; Chagall/Seurat: L.C.S. m8. *the modernist, that's modern too, there's something about them*.

Theoretical Categories: 3. Contextual Associations.

3i. Thematic time associations:

a) style of items:

i) **Modern:** no examples;

ii) **Past.** Clothes :Leonardo *old fashioned*, Seurat: *eighteenth century* L.C.S. m5; F.O.S. m11.

b) themes and thematic rules.

i) **Modern:** Seurat *most modern, like Victorian days* L.C.S. m4; Chagall: *different view, not recent, old fashioned things in it*, F.O.S. m9;

ii) **Past.** Distinction between thematic time and the time painted for Leonardo, F.O.S. m9; Seurat: *Impressionist way people are*, F.O.S. m2.

3ii. Technical time associations:

a) stylistic development.

i) **Modern.** Chagall: F.O.S. *not an older style*, u4; items painted in a modern style, u2; relatively modern style, u4; *same modern style of disorganisation not a representation*, u5; change related to *revolution against traditional concepts of art*, u7.

ii) **Past.** Leonardo: a past style: *Renaissance* (F.O.S. u6. u4. from: the artist u2;; *painting*, u3; *warm colour and theme* u7); *traditional representation* (F.O.S. u5); Seurat: ranking in time with generalised style rules (E.C.S. m3. *normal scene; fit into any era* F.O.S. u4); Chagall: *Surrealism* (F.O.S. u4) and a change from *traditional art to the artist's revolution* (F.O.S. u7).

The operational categories and responses are shown separately in Appendix XI, for the ability to give reasons for present (Figure 75) and past artworks (Figure 76). Subjects were given separate ratings for modern and past reasons (Appendix VII). In both cases references to modern were rated as L.C.O. because they repeated the question. In relation to past reasons there were: three lower level borderline cases that were rated as E.C.O. for *looks old* (L.C.S. j9, and implicit references to items (E.C.S. j3; L.C.S. j7). All but five subjects could give reasons for modern and/or past artworks. The five void responses included the non selection (E.C.S. j4), negative responses for both (E.C.S. j1, j10), and negative responses with vacuous responses for past artworks (E.C.S. j3; L.C.S. j7). However, less subjects were able to give reasons for present artworks (not: E.C.S. j2, j6, j8; L.C.S. j5, j9; m1, m8 m10), than past artworks (not E.C.S. j11, j12; L.C.S. m8). Subjects who were unable to give reasons were assumed to have limited time concepts. The thematic and technical reasons for both modern and past artworks, were given separate data analyses.

Thematic reasons for modern and past art were given by:

- i. six subjects for modern artworks (E.C.S. j11, j12; L.C.S. m6; F.O.S. m7, m9, m11);
- ii. ten subjects for past artworks (E.C.S. j2, j6, j8; L.C.S. j5, j9, m4, m5; L.C.S. m7, m9, m11).

The majority of subjects made literal time associations with:

- a) items and actions: (modern: E.C.S. j11; L.C.S. m4, m6; F.O.S. m7, m11; past E.C.S. j2; L.C.S. j9, m4, m5; F.O. S. m7, m11);

b) thematic time and rules (modern: L.C.S. m4; L.C.S. m4; past: F.O.S. m7. M9).

Four subjects made psychological time associations with: thematic time and rules,(
modern L.C.S. m9; different points of view: past: E.C.S. j6. interesting , E.C.S. j8.
make believe; F.O.S. m2. impressionist way people are).

Technical reasons for modern and past art were given by:

i. fourteen subjects for modern artworks (E.C.S. j2, m3; L.C.S. m1, m4, m5, m8,
m12; F.O.S. u1, u2, u3, u4, u5, u6, u7);

ii. twelve subjects for past artworks (E.C.S. m3; L.C.S. m1, m6, m10, m12;
F.O.S. u1, u2, u3. u4, u5, u6, u7).

The majority of subjects made literal time associations with:

a) the process and technical rules: (modern: L.C.S. m5. F.O.S. u3, u5 ; past: L.C.S.
m1);

b) stylistic development: ranking in time (modern: F.O.S. u6; past: L.C.S. m6,
m10, m12 u1, u4).

Ten subjects made psychological time associations with:

a) the process and technical rules: (modern: E.C.S. m3. *plain and simple*, L.C.S.
made up, m4. *imaginative skills*, m12; past: *normal scene* included with ranking,
E.C.S. m3);

b) ranking by art styles (modern: *style*, F.O.S. u1, u2, u4, as *disorganisation*
F.O.S. u5; as *revolutionary change* F.O.S. u7; past: *Renaissance*, F.O.S. u2, u3,
u4, u6; traditional, F.O.S. u5, and *revolutionary change from tradition*, F.O.S. u7).

The implicit and explicit thematic and technical reasons for historic differentiation corresponded with reasons for dating. However, there was a greater focus on stylistic differences. In addition several subjects used ranking by time and styles to differentiate between past and modern artworks. The categories for three operational levels indicated that this ability had a tripart structure.

6.2.5.2.1.5. The Ability to Classify by Art Movements.

Data analysis indicated that naming art movements could be assessed through the complexity of the literal and psychological associations with time. However, the assessment was limited to the generalisation of an art movement or references to traditional art. One operational category was derived from data analysis of references to style names for three artworks (Leonardo, Seurat, Chagall):

Theoretical Categories: 3. Contextual Associations.

3i. Technical Time: Associations with Art Movements.

Leonardo: *Renaissance*, F.O.S. u1, u2, u3, u4, u6; *traditional* F.O.S. u5, with religious painting, F.O.S. u7; Seurat: *Post-Modern*, F.O.S. u1; *Surrealism*, F.O.S. u4; *Pointillism*, F.O.S. u3, u7; *Impressionist*, F.O.S. m2, u5; Chagall: *Modern*, F.O.S. m2, u1, u5, u6, with process, theme and meaning, E.C.S. m3; *Surrealism*, F.O.S. u2, u7; *Expressionism*, F.O.S. u4.

The raw data for responses to three artworks from each operational sample for the ability to classify by art movements are shown in Appendix XI, Figure 77.

References to *modern* were rated as F.O. as an abstract generalisation. The references to each artwork were given a combined rating according to the highest level of response as shown in Appendix V11. Nine subjects made references to style names, although these included vacuous responses for: Leonardo and Seurat, E.C.S. m3; Leonardo, F.O.S. m2; Seurat, F.O.S. u2, u6. The remaining twenty-two

void responses included two subjects who gave negative responses for all three artworks (E.C.S. j1, j4.) and twenty subjects who gave negative and /or vacuous responses for all three artworks (E.C.S. j2, j3, j6, j8, j11, j12; L.C.S. j5, j7, j9, m1, m4, m5, m6, m8, m10, m12; F.O.S. m7, m12, m11). Negative and vacuous responses for younger subjects were assumed to be due to lack of abstract generalisations and for older subjects lack of knowledge.

All of the references to art movements were technical. Subjects either referred to art movements (*Modern*: Chagall, E.C.S. m3; F.O.S. m2, u1, u5, u6; *Post-modern*: Seurat, F.O.S. u1; *Impressionism*: Seurat, F.O.S. m2, u5; *Pointillism*: Seurat, F.O.S. u3, u7; *Expressionism*: Chagall: F.O.S. u4; *Surrealism*: Seurat, u4; Chagall, u2, u7) or *traditional* art (Leonardo: F.O.S. u4, u7). All but two of the associations were psychological. *Pointillism* (Seurat: F.O.S. u3, u7) was derived from literal associations. The one theoretical category confirmed the projected mono structure of this ability, which required formal operational thinking. However, the assessment focus on stylistic movements, necessitated a vacuous rating for:

a) the theme e.g. *mother and baby* or thematic context e.g. *real, imagined, an idea; dots, pillated*; which could be regarded as pre-requisite stylistic responses.

In addition all of the responses from the E.C.S. apart from j6. referred to titles, which had not been elicited by an earlier question.

6.2.5.2.1.6. Summary of the Testing of the Tripart Structure of the Stylistic Abilities.

Data analysis indicated that names, dates and associations with the thematic and technical contexts, could be assessed according to the complexity of the literal and psychological associations. The country of origin was assessed through associations of geographic distance with the thematic location and the nationality of artists or styles. The dating of artworks was assessed through time associations with thematic and contextual time; the style of items, processes, artists, art movements and ranking by time and styles of working. Implicit references to time indicated that stylistic abilities, would require defining by the question. In addition responses for the ability to classify by art movements indicated a developmental progression from thematic items and actions to, processes and functions and finally the abstract generalisation of style names.

6.2.5.2.2. The Art Historical Abilities.

Separate data analyses were given of the six art historical and one contemporary criticism ability, although all of these abilities could be assessed according to the complexity of the thematic and technical associations with time.

6.2.5.2.2..1. The Ability to Recognise Why Artworks Change Over Time.

Data analysis indicated that recognising why artworks changed over time, was based on thematic and technical differences. These could be assessed according to the complexity of the literal and psychological associations. The following

thematic and technical operational categories were derived from data analysis of reasons for change over time.

Tautological Categories: 1. Simple Contextual Associations.

1i. differences based on preferences (*more nice*, E.C.S. j6).

Circumstantial Categories: 2. Complex Contextual Associations.

2i. Thematic differences based on comparisons with reality (*looks real*, E.C.S. j8);

3ii. Technical differences:

A) based on the process (drawing, painting: E.C.S. j6, j10, j11; L.C.S. j10) and materials (L.C.S. m4);

B) based on technical rules: originality (*different types*, F.O.S. m2).

Theoretical Categories: 3. Contextual Associations.

3i. Thematic differences:

A) based generalised on items, events and the physical location (*scenery*, L.C.S. m6; *surroundings*, F.O.S. m11);

B) relative rules: differences related to historical changes in the style of items (F.O.S. m11), artist's ideas (L.C.S. j7), people's viewpoints (F.O.S. m7), the artist's feelings and subject matter (F.O.S. u5), and social life (F.O.S. u1).

3ii. Technical differences:

A) based on styles of painting (E.C.S. m3, *colour*) and originality (*change in trend*, F.O.S. u4; developed new techniques, u6; *slow break down to create new forms*, F.O.S. u7);

B) relative rules relating technical differences to the artist's intention (*depends what image you want to give*, L.C.S. m1), and historical differences to changes in style (L.C.S. m8; F.O.S. u2), or views on art and processes (L.C. S. m12).

The operational categories and responses for the ability to give reasons for why artworks change over time, are shown in Appendix XI, Figure 78. There were three lower level borderline cases, that were rated as L.C.O. for references to the technical processes (*way painted* E.C.S. j6; *draw* j10) and *type* (E.C.S. j10). There were three borderline cases that were rated as F.O. for an abstract generalisation (*scenery* L.C.S. m6; *surroundings* F.O.S. m11) and relative intentions (L.C.S. m1). All but seven subjects were able to give reasons for changes over time. The seven void responses included six negative responses (E.C.S. j1, j2, j4, j12; L.C.S. j9; F.O.S. m2), and one vacuous response (L.C.S. j5. *takes a long time to paint*).

The void responses were assumed to be due to limited time concepts for understanding the question.

Subjects associated thematic and technical differences with historical change. However, several subjects made implicit time associations (E.C.S. j3, j6, j8, j11; L.C.S. m6; F.O.S. m11, u1, u3), including references to *style* (E.C.S. m3), *trend* (F.O.S. u4) *developed* (F.O.S. u6). Explicit associations included references to time (L.C.S. m8; F.O.S. m7, u2) *in particular* (F.O.S. u5) and *in history* (L.C.S. j7) as degrees (*early*, L.C.S. m10; *early stages compared with today*, L.C.S. m4; as movement (*started* F.O.S. m2; with *slowly* (F.O.S. u7).

The following data analyses were made of thematic and technical differences. Nine subjects associated change with thematic differences. There were more psychological than literal associations. Six subjects made psychological associations with preferences (L.C.S. j3), and relative rules (the style of items, F.O.S. m9; artist's feelings and subject matter for a particular time, F.O.S. u5); different views (L.C.S. j7; F.O.S. m7) and social life (F.O.S. u1). Three subjects made literal associations with: real life (E.C.S. j8), items, actions and the physical location (E.C.S. m6; F.O.S. m11).

Fifteen subjects associated change with technical differences. There were more psychological than literal associations. Nine subjects made psychological associations with: good, better materials (L.C.S. m4); styles of painting (E.C.S. m3); originality as trends (F.O.S. u6), new developments (F.O.S. u6), intentions

(*want* F.O.S. u7) and relative rules for intentions (F.O.S. m1), styles (L.C.S. m8; F.O.S. u2) views and processes (L.C.S. m12). Five subjects made literal associations with processes and materials (E.C.S. j6, j10, j11; L.C.S. m10, F.O.S. m2, u3). The majority of subjects associated change with technical differences.

The categories for three operational levels indicated that this ability had a tripart structure. However, time associations were implicit and explicit.

6.2.5.2.2.2, The Ability to Infer from the Artwork the Art Practice at the Time of Production.

Data analysis indicated that thematic and technical inferences about the art practice at the time of production could be assessed according to the complexity of the literal and psychological associations. The following thematic and technical operational categories were derived from data analysis of references to art practice for one of six artworks (Hogarth, Manet, Bellini, Matisse, Mondrian, Kandinsky).

Tautological Categories: 1. Simple Contextual Associations.

- 1i. Thematic Practice: items: Bellini: E.C.S. j11. *colour, clothes and hair*;
- 1ii. Technical Practice: colour with shape: Matisse: E.C.S. j8. *bright and dark*; F.O.S. m7, *lots of colour*; Mondrian: L.C.S. j9. *black, blue, red and white*; L.C.S. m10, *shapes and colour* ;

Circumstantial Categories: 2. Complex Contextual Associations.

2i. Thematic Practice:

- A) items: Manet: E.C.S. j2. *people from the olden days*; Mondrian E.C.S. j3. *dragons, people horses with four legs*;
- B) thematic rules: Hogarth: *details* (L.C.S. m1, m6) with interesting and items (L.C.S. m12);

2ii. Technical Practice:

- A) techniques: Matisse: L.C.S. j5. *smudgy paint* ;
- B) technical rules: i. Variety of formal elements/media: (Mondrian: F.O.S. u3. *probably lots of lines*; Kandinsky: F.O.S. u1. *all sorts of water-colour, ink, charcoal*), alternative painting to avoid rejection of formal artworks: Mondrian: L.C.S. m8;

Theoretical Categories: 3. Complex Technical Associations.

3i. Thematic Practice: no examples.

3ii. Technical Practice: technical rules. Mondrian: F.O.S. m9. *people started more modern art at this time ;m11. very basic colours and straight lines, not many pictures of people, more object ; u2. bright colour, simple things, nothing too elaborate .*

The operational categories and responses for the ability to infer from the artwork the art practice at the time of production, are shown in Appendix XI, Figure 79.

There were two lower level borderline cases that were rated as L.C.O. for probability (F.O.S. u2) and complex items (E.C.S. j3. *dragon*). There were two higher level borderline cases that were rated as F.O. for abstract generalisations (*modern* L.C.S. m8; *basic* F.O.S. m11). All but fourteen subjects were able to infer the contextual art practice (E.C.S. j1, j4, j6, j10, j12; L.C.S. j7, m4, m5; F.O.S. m2, u4, u5, u6, u7). It was assumed that the negative responses for younger subjects were due to limited time concepts, and for older subjects lack of information. The seventeen thematic and technical inferences about art practice were given for: Hogarth (L.C.S. m1, m6, m12), Manet (E.C.S. j2), Bellini (E.C.S. j11), Matisse (E.C.S. j8; L.C.S. j5; F.O.S. m7, m9, m11), Mondrian (E.C.S. j3; L.C.S. j9, m8, m10; F.O.S. u2, u3). Subjects identified art practice through similarities, apart from two references to alternatives (E.C.S. j3; L.C.S. m8). Only two subjects made explicit associations with time (E.C.S. j2. *olden days*; F.O.S. m9. *time modern art started*). Separate data analyses were given for thematic and technical reference to art practice.

Six subjects made thematic associations. All but one of the subjects made literal associations with:

a) items (E.C.S. j3, j11), in context (E.C.S. j2);

b) thematic rules: *detail* (L.C.S. m1. M6).

One psychological association was made for a thematic rule (L.C.S. m12. *interesting*).

Eleven subjects made technical associations. The majority of subjects (seven) made literal associations with:

a) formal elements : *colour and shape* (L.C.S. j9; m10;

b) technical rules: variety of colour, line or media (E.C.S. j8; F.O.S. m7, u1, u3);

Four subjects made psychological associations with technical rules (L.C.S. m8. attitude to formal painting; F.O.S. m9. *modern art started*; m11. *basic* ;u2.

nothing elaborate). The majority of subjects made technical associations with art practice. The categories for three operational levels indicated that this ability had a tripart structure.

6.2.5.2.2.3. The Ability to Recall Knowledge of an Artist's Life.

Data analysis indicated that recalling thematic and technical knowledge of an artist's life, could be assessed according to the complexity of the literal and psychological associations. Subjects made inferences about the artist's previously identified (Appendix XI, Figure 66). The following thematic and technical operational categories were derived from data analysis of subjects references to the artist's lives.

Circumstantial Categories: 2. Complex Contextual Associations.

2i. Thematic associations with the artist's life: items, Titian: L.C.S. m10. *Titian's paintings had people in* ;

2ii. Technical associations with the artist's life:

A) Formal Elements Van Gogh: L.C.S. m4. *colourful, he likes colours*;

B) Techniques and rules. Monet: L.C.S. m8. *flat brush strokes, a recent painting*; Toulouse Lautrec : F.O.S. u2. *I've a couple of prints at home, brush stokes quickly/not quickly, not correct colours* ; Picasso: L.C.S. j7. *made paintings like no other artist from rubbish*;

Theoretical Categories: 3. Contextual Associations.

3i. Thematic associations with the artist's life: events. Goya: F.O.S. u6. *did he fight in the French Revolution and do tortures?*

3ii. Technical associations with the artist's life:

A) Techniques and rules. Monet: E.C.S. m3. *he's famous and in a lot of paintings he blends abnormal colour*; Picasso: F.O.S. m9. *used to change things and make them look modern*;

B) Art movements and rules. Picasso: F.O.S. m9. *because he did modern art, Cubist* ; Surrealism: F.O.S. u2. *is very extreme and outrageous*.

The operational categories and responses for the ability to recall information about the artist's life are shown in Appendix XI, Figure 80. There was one borderline lower level case that was rated as L.C.O. for a generalisation (*colourful*, L.C.S. m4). Ten subjects who named an artist made thematic or technical associations with the artist's life (Titian, L.C.S. m10; Goya, F.O.S. u5; Monet, E.C.S. m3; L.C.S. m8; Van Gogh, L.C.S. m4; Toulouse Lautrec, F.O.S. u2; Picasso: L.C.S. j7; F.O.S. m2, m9; Surrealism, F.O.S. u1). The twenty-one negative responses included the subjects who were unable to name an artist (E.C.S. all but m3; L.C.S. j5, j9, m1, m5, m6, m12; F.O.S. m7, u3, u5) and three further subjects who referred to the nationality (F.O.S. m11) or several artist's (F.O.S. u4, u7). Separate data analyses were given for thematic and technical associations.

Two subjects made thematic historical associations with the artist's life through items (L.C.S. m10. *people*) and an historical event (F.O.S. u6. *French Revolution, tortures*). The thematic associations were literal (L.C.S. m10) and psychological (F.O.S. u6. *tortures*).

Eight subjects made technical associations with the artist's life through:

a) the artist's colour preference (L.C.S. m4);

- b) techniques and technical rules mainly for originality (E.C.S. m3; L.C.S. j7, m8; F.O.S. m9, u2);
- c) art movements and rules (F.O.S. m2. *Cubist, modern art*; u1. *Surrealism, extreme, outrageous*).

The technical associations were literal (L.C.S. j7, m8; F.O.S. u2) and psychological (E.C.S. m3. *abnormal, famous*; L.C.S. m4. *likes*; F.O.S. m2, m9. *modern*; F.O.S. u1. *Surrealism, extreme, outrageous*). Subjects used more technical (eight) than thematic (two) historical associations. The categories for two higher level categories indicated that this ability had a bipart structure. However, the projected measure needed to include psychological associations.

6.2.5.2.2.4. The Ability to Use Knowledge of the Artist's Life to Understand the Artwork.

Data analysis indicated that applying technical and thematic knowledge to an artwork, could be assessed according to the complexity of the literal and psychological associations. The following thematic and technical categories, were derived from data analysis of references that related knowledge to the artwork.

Circumstantial Categories: 2. Complex Contextual Associations.

2i. Thematic correspondence: no examples.

2ii. Technical correspondence: techniques and rules. Picasso: L.C.S. m7. *did swirly pictures*; Tolouse Lautrec: F.O.S. u2. *used unusual colours*.

Theoretical Categories: 3. Contextual Associations.

3i. Thematic correspondence with the function: Monet: E.C.S. m3. *abnormal to show his feeling*;

3ii. technical correspondence with art movements and rules: Surrealism: F.O.S. u1. *this painting seems outrageous*;

3iii. Rules for a thematic and technical correspondence. Artist's life (background, reasons, feelings, expression, maturity in painting) compared with other artworks to find links or particular themes (F.O.S. u4, u5) and identify the artist (F.O.S. u7).

The operational categories and responses for the ability to use knowledge of an artist's life to understand the artwork are shown in Appendix XI, Figure 81. The seven subjects who could apply information to understand the artwork only included four subjects who could recall information (E.C.S. m3; L.C.S. j7; F.O.S. u1, u2). There were three further subjects who did not recall information (F.O.S. u4, u7) or name an artist (F.O.S. u5). The six subjects who were unable to apply recalled knowledge were assumed to lack comparative analysis to identify a correspondence (L.C.S. m4, m8, m10; F.O.S. m2, m9, u6). Separate data analyses were undertaken for thematic and technical correspondences.

One subject made a thematic correspondence with the artworks function (E.C.S. m3. *abnormal to show feelings*). The thematic association was psychological.

Three subjects made a technical correspondence with the process and rules (L.C.S. j7. *did swirly paintings*; F.O.S. u2. *unusual colours*), art movements and rules (F.O.S. u1. *this painting seems outrageous* i.e. Surreal). The associations were literal (L.C.S. j7; F.O.S. u1) and psychological (F.O.S. u1. *outrageous*).

Three subjects identified rules for thematic and technical correspondence with the artist's life or style (F.O.S. u4, u5, u7).

Subjects made thematic and technical correspondences with the artist's life.

However, correspondence rules were given by subjects who failed to recall information. This indicated that applying information required different thinking

skills from recalling information. The two higher level operational categories indicated that this ability had a bipart structure.

6.2.5.2.2.5. The Ability to Infer the Life at the Time of Production.

Data analysis indicated that inferences about life at the time of production were thematic. Inferences could be assessed according to the complexity of the literal and psychological associations. The following thematic operational categories, were derived from data analysis of inferences for three artworks (Leonardo, Seurat, Chagall).

Tautological Categories: 1. Simple Contextual Associations.

1i. The thematic context associated with items and status:

Leonardo: *different floor*, E.C.S. j3; *long hair and trees* L.C.S. j9; E.C.S. j10; L.C.S. m4. *poor people because of clothes*;
Seurat: *clothes* L.C.S. j9;

Circumstantial Categories: 2. Complex Contextual Associations.

2ii. The thematic context associated with:

A) Items, actions and physical location:

Seurat: E.C.S. j11. *a walk on a sunny day* m12; F.O.S. *way dressed and spent their spare time* m7; *the park, people in the sun* u1; *types of clothes, pastimes, boats and picnics: its obviously the summer* u2; *how ladies and gents dressed on day trips* u4.

Chagall: *from someone's imagination: that there were trees and people* L.C.S. m12;

B) Status and emotions:.

Leonardo: E.C.S. *people kind to their children* j6; L.C.S. *not many rich people, a lot would be poor* j7;

Seurat: L.C.S. *looks easy not a lot of worries or anything* m6; *life pretty easy, everybody rich, expensive clothes. everyone out in summer, lakes and woody places* m10; F.O.S. *way dressed, look relaxed and rich* m2; *a lot of rich people, even a monkey* m9; *rich people often spent days out at lakes and fields, and take dogs for a walk* m11; *seems relaxing; people look rich* u3; *rich people on a sunny day*, u6.

C) Thematic rules:

Seurat: *they are alive* E.C.S. j12;

All three artworks: L.C.S. m12:.. Leonardo: *like real life painting*; Seurat: *how I imagine it to look in a park*; Chagall: *from someone's imagination. That there were trees and people*;

D) Historical time:

Leonardo: L.C.S. j5. *a long time ago that happened, its got nice colours* ;

Theoretical Categories: 3. Contextual Associations.

3i. Thematic associations with:

A) Actions, status, emotions and order.

Leonardo: L.C.S. *not rich or extravagant, seem very plain people*; m1; F.O.S. *easy, laid back, a very happy time, not organised, natural and a family* u7; Seurat: L.C.S. *there was an attraction to water* m8; *shows activities and leisure time, because of the amount of people* u5;

B) Historical time.

Seurat: E.C.S. *old style dresses looks peaceful, sitting, playing, walking, looks like the turn of the century* m3.

The operational categories and responses for the ability to infer life at the time of production are shown in Appendix XI, Figure 82. There were four borderline cases for associations with life at the time. Two were rated as L.C.O. for references to *expensive* (L.C.S. m10) and *pastimes* (F.O.S. u2). Two were rated as F.O. for references to *leisure* (F.O.S. u5) and *organised* (F.O.S. u7). All but six subjects could make associations with life at the time of production. (E.C.S. j1, j2, j4, j8, L.C.S. m4, m6). The six negative responses were assumed to be due to limited time concepts for making contextual associations. However, one negative response included the selection of an artwork (E.C.S. j8. Leonardo).

Subjects had a choice of three artworks (Leonardo, Seurat, Chagall). Most subjects made contextual associations with one artwork (Leonardo: E.C.S. j3, j6, j10; L.C.S. j7, m4; Seurat: E.C.S. j11, j12, m3; L.C.S. m6, m8, m10; F.O.S. m2, m7, m9, m11, u1, u2, u3, u4, u6). This included three subjects who gave one example, although they considered that all of the artworks could be associated with the context (Leonardo: L.C.S. m1; F.O.S. u7; Seurat: F.O.S. u5). Two further subjects who made contextual associations with more than one artwork, were given a combined rating (L.C.S. j9. Leonardo, Seurat: E.C.O.; m12).

Leonardo, Seurat, Chagall: L.C.O.). All of the associations were thematic, and referred to social life styles. However, two technical references (E.C.S. j12. *painting*; L.C.S. j12. *colours*) were included with thematic responses.

The majority of subjects (twenty) made psychological associations with:

A) the social lifestyle as status, attitudes, emotions (E.C.S. j6, j10; L.C.S. j7, m1, m4, m6, m8, m10; F.O.S. m2, m9, m11, u3, u6) including order (F.O.S. u7. *not organised, natural family life*) and pastimes (m7. *spent spare time*; u2. *pastimes*; u5. *leisure*)

B) thematic rules: life as *alive* (E.C.S. j12), *real life or from someone's imagination, with how I would imagine it to look* (L.C.S. m12).

C) with time through the style of items and emotive location (E.C.S. m3). Five subjects made literal associations with the contextual lifestyle:

A) through items, actions and the physical location (E.C.S. j3, j11; F.O.S. u1, u4).

B) with time (L.C.S. j9. *happenings a long time ago*).

The categories for three operational levels indicated that the structure of this ability was tripart.

In addition to making associations with the thematic context, subjects were asked to give themes and alternative examples. The operational categories and responses for alternative examples and themes are shown in Appendix XI, Figures 83, 84.

However, no rating was given for these responses as similar assessments were undertaken for the visual abilities. In relation to themes eight of the twenty-five subjects who made associations with the thematic context identified themes for

Seurat (F.O.S. m7, u1, u2, u3, u4, u5, u6) and Leonardo (F.O.S. u7). The six circumstantial themes were literal and based on literal associations: (Seurat: *out for the day*, u1; *a summer's day*, u2; *a Sunday walk* u3; *Sunday afternoon by the river* u4; Leonardo: F.O.S. u7. *shepherd's walk*) and emotive (Seurat: F.O.S. *they enjoy life* m7; *relaxing by a river* u6). There was one emotive theme for the theoretical level (Seurat: F.O.S. *leisure* u5) which was based on psychological associations.

Eleven of the twenty-five subjects gave alternative contextual associations (E.C.S. m3; L.C.S. m8, m10, F.O.S. m9, m11, u1, u2, u4, u5, u6, u7). It was assumed that subjects who were unable to give alternative associations lacked mental flexibility.

The alternative operational categories corresponded with the categories for assessing life at the time of production.

1) Circumstantial Alternative Life Styles.

A) Items, actions, physical location:

Seurat: E.C.S. *sitting by a river, when hot, watching boats* m3; F.O.S. *it was slower* u6;

B) Status and emotions.

Seurat: L.C.S. *sitting down and relaxing* m10; F.O.S. *people look fairly well off* u2; Leonardo: *it wasn't a time when people were rich, barefoot* u7.

2) Theoretical Alternative Lifestyles:

A) Actions, location, status, emotions, social order:

Seurat: L.C.S. *it looks like there wasn't much pollution*, m8; F.O.S. *an ordinary life, and the whole family went out* m11; *it was very strict and rigid* u1; *a happy environment, almost upper class* u5.

B) Historical social order from the subject matter.

Seurat: F.O.S. *for children if very restricted made when I said, they never saw their parents: an outing with governors or nanny* m9; *I think people were more formal then* u4.

Alternative examples included literal ((L.C.S. m8. *pollution* ; u6. *slower life*)

and psychological associations (F.O.S. u5, *happy environment*; F.O.S. social

order and status: m9, m11, u1, u2, u4 u7). The circumstantial and theoretical levels for explicit themes and alternative contextual examples confirmed the previous finding that these were bipart abilities.

6.2.5.2.2.6. The Ability to Validate Inferences About the Historical Context.

Data analysis indicated that the validation of thematic contextual inferences could be assessed according to the complexity of the literal and psychological associations. The following operational categories were derived from data analysis of contextual agreement or disagreement and the method of justification.

Circumstantial Categories: 2. Complex Contextual Associations.

2i. Thematic contextual agreement/disagreement for items, actions and status justified by:

A) Hypothetical argument. E.C.S. m3. *yes and no: what a few people would do: I don't think people walked monkeys in those days; F.O.S. u6. yes it looks like the rich: if rich they would look like that;*

B) Comparisons with Independent Sources of Information: L.C.S. j7. *yes: facts from archaeologists; m4. don't know, artist may have done in-between rich and poor: ask the artist, find out in a book; m8. I think it is: go to a library to find out; m10. yes: look at more pictures painted at that time m12. maybe like that, but not completely: find out from comparing it with books or other pictures; F.O.S. m2. unsure when monkeys were pets: use an encyclopaedia ; m7. not everyone enjoys life, there is always evil at the time: look in and paintings books and art pictures to see if they look the same; m9. for the rich, not the poor: look in history books at the time that's similar to them; m11. there were other kinds of people: look in books and other paintings and compare them; u1. I believe so from what wearing and doing: look it up in a book; u3. not really: possibly look in a book; u7. I think so they are happy: by the clothes and the way he paints.*

Theoretical Categories: 3. Contextual Associations

3i. Generalised thematic inferences or independent sources of information:

L.C.S. m6. *yes, because it seems realistic: compare with other paintings whether the same or different; u2. not at all, some people might not have a lot of money: find out the exact date the picture painted and represents, and research it; u5. I think so from what I've seen from photographs: research when done, who done by, compare with photo's of the age, and social documents .*

The operational categories and responses for the ability to validate inferences

about the historical context, are shown in Appendix XI, Figure 85. Contextual

agreement/ disagreement and the method of justification were given a combined rating according to the highest level of response. There were five higher level borderline cases. Two were rated at L.C.O. for common generalisations (L.C.S. j9. *archaeologist*; F.O.S. m2. *encyclopaedia*). Three were rated as F.O. for generalising the thematic function (L.C.S. m6. *realistic*) and *research* (F.O.S. u2, u7). Eighteen subjects were able to validate the visual evidence about the historical context from the theme. The thirteen negative responses included the subjects who were unable to make contextual associations (E.C.S. j1, j2, j4, j8; L.C.S. m5) apart from L.C.S. m4, and eight further negative responses (L.C.S. j3, j6, j10, j11, j12; L.C.S. j5, j9, m1). It was assumed that the further negative responses were due to a lack of comparative analysis for independent agreement. Separate data analyses were given for contextual agreement/disagreement and the method of justification.

In relation to methods of agreement/disagreement data analysis indicated that ten subjects agreed that their inferences were a true reflection of life at that time (L.C.S. j7, m6, m8, m10; F.O.S. u1, u4, u5, u6, u7) including one uncertain agreement (F.O.S. m2). Agreement was confirmed by assertions (*yes* L.C.S. j7, m10; *I think so* L.C.S. m8; F.O.S. u4. u5) or references to items (F.O.S. m2, u2, u5); emotions or status (F.O.S. u6; u7) and thematic functions (L.C.S. *it seems realistic* m6). Eight subjects disagreed (F.O.S. m7, m11, u2, u3) including uncertain responses (L.C.S. m4, m12) and combined agreement/disagreement (E.C.S. m3, m12). Disagreement was supported by an assertion (F.O.S. *not really* u3) and exclusions or alternatives (E.C.S. *a few* m3; L.C.S. *artist intended in-*

between rich and poor m4; not completely m12; F.O.S. not everyone m7; not for the poor m9; other kinds of people m11; some people u2).

The majority of agreements/disagreements involved literal associations with: items (E.C.S. m3; L.C.S. m12; F.O.S. m2, u1, u2, u5). Assertions as 'yes' or *not really* were assumed to be literal (L.C.S. j10, m10; F.O.S. u3). There were seven psychological associations with emotions and status (L.C.S. m4; F.O.S. m7, m9, m11 u6, u7) or asserted thinking (F.O.S. u4). However, references to thinking could be literal or psychological depending on use.

In relation to the methods of justification data analysis indicated that the justification for agreement/disagreement was based on referential adequacy.

Evidential support was derived from:

a) hypothetical argument (E.C.S. *I don't think people walked monkeys in those days* m3; F.O.S. *if they were rich, I suppose they would look like that* u6).

b) independent sources of evidence which included:

i) *archaeological facts* (L.C.S. j7); ii) *books, pictures, paintings, a library* (E. C.S. m3; L.C.S. m6, m8, m10, m12; F.O.S. m2, m9, m7, m11, u1, u3, u5) with *ask the artist* (L.C.S. m4)

iii) *style of items and manner of working* (F.O.S. *clothes, and way paints* u7).

In addition ten subjects identified the need for comparative evidence (L.C.S. m6, m10, m12; L. C.S. m7, m9, m11, u2, u4. u5).

The hypothetical associations were literal (E.C.S. m3) and psychological (F.O.S. u6). The comparisons with independent sources promoted

- a) literal associations with similar items, places, paintings, historical contexts (E.C.S. m3; L.C.S. j7, m4, m8, m10; F.O.S. m7, m9, u1, u3, u4);
- b) psychological associations with the methodology (*compare* L.C.S. m6, m12; F.O.S. m11, u5; *research* F.O.S. u2). The two higher level operational categories indicated that this ability had a bipart structure.

6.2.5.2.2.7. The Ability to Comparatively Evaluate Critical Merit.

Data analysis indicated that the thematic and technical evaluation of critical merit, could be assessed according to the complexity of the literal and psychological associations. The following thematic and technical operational categories, were derived from data analysis of reasons for agreement or disagreement with comments about details and genius for Manet's (1881A Appendix V) artwork. Joint references and three unclear references (E.C.S. j1, j8; F.O.S. m11) were classified with references to genius.

Tautological Categories: 1. Simple Comparisons of Merit.

1i. Thematic details as items.

A) agreement: E.C.S. j11. *people the same as us*;

1ii. Technical details as colour/lines:

A) agreement: L.C.S. j5 *nice colours*;

B) disagreement with lines: E.C.S. j2.

Circumstantial Categories: 2. Complex Comparisons of Merit.

2i. Thematic Rules for: 1) Details:

A) agreement: L.C.S. m12. *clarity for portraits and depth*;

B) disagreement, based on the amount of detail (L.C.S. j7; F.O.S. u6) and clarity (L.C.S. m1);

2) Genius.

A) asserted agreement with agreement for details (*have ugly spots*, L.C.S. m4);

B) disagreement based on clarity (*can't tell what I'm looking at* with disagreement for details L.C.S. m6; *doesn't show the way they are* F.O.S. m2).

2ii. Technical Rules for:

1) Details.

A) agreement: skill (E.C.S. j10. *not bothered about mistakes*; L.C.S. j9. *could get it wrong*) interest (F.O.S. m7. *a bit boring if lines everywhere*).

2) Genius.

A) agreement based on *imagination* (E.C.S. j1) and skill (E. C.S. j6. *a good painting*);

B) disagreement based on the size and amount of similar works with asserted agreement for details, L.C.S. m5.

Theoretical Categories: 3. Comparisons of Merit.

3i. Thematic Items and Rules for:

1) Details.

A) agreement with *fashion* (E.C.S. m3) an ideal portrait (F.O.S. *not trying to flatter* m9; *not particularly attractive, other painter's used to make them attractive* u3);

B) disagreement based on lack of clarity (F.O.S. u1. *the reflection could have been better*).

3ii. Genius.

A) agreement based on the artist's thinking time for imagining a realistic bar, with agreement for the amount of details L.C.S. m8; a good picture, with the identification of error for details, F.O.S. u4.

3ii. Technical Rules

1) Details

A) agreement based on skill (F.O.S. u5. *not bothered about detail, an impression*);

2) Genius.

A) agreement based on skill (E.C.S. m3. *complicated*; F.O.S. m11, amount of *experience* for painting details);

B) disagreement: based on similar people *doing the same standard, only classed as genius over time*, with asserted agreement for details, F.O.S. u2 ; and error for attention to detail, F.O.S. u7.

The operational categories and responses for the ability to comparatively evaluate

critical merit, are shown in Appendix XI, Figure 86. References to genius were

rated as L.C.O., because they involved repeating the question. There were seven

higher level borderline cases, that were rated as F.O. for generalisations of:

realistic (L.C.S. m8), *flatter* (F.O.S. m9), *experience* (F.O.S. m11), *standard*

(F.O.S. u2), *attractive* (F.O.S. u3) *in terms of art* (F.O.S. u4) and the

identification of error (F.O.S. u4, u7). All but four subjects were able to

comparatively evaluate critical merit. There were four negative responses (E.C.S.

j8, j12; L.C.S. m10) which were assumed to be due to a lack of understanding of

the question, and one assertion (*yes*, E.C.S. j4), which was assumed to be due to lack of comparative analysis.

Nineteen subjects gave partial agreements/disagreements with

a) details (agreement: E.C.S. j3, j10, j11; L.C.S. j5, m12; F.O.S. m9, m11, u3, u5, u6, u7, including negative agreements: L.C.S. j9; F.O.S. m7; disagreement: E.C.S. j2, L.C.S. j7; F.O.S. u1);

or

b) genius (agreement: E.C.S. j1, j6. m3).

Seven subjects referred to both criteria, for joint agreement (L.C.S. m8, m4) or disagreement (F.O.S. m2); or agreed and disagreed with the criteria (L.C.S. m5, m6; F.O.S. u2, u4). Separate data analyses were given of thematic and technical reasons for agreement/disagreement.

The thematic reasons for agreement and disagreement were as follows. In relation to details, eleven subjects made thematic associations for:

a) agreement with items (E.C.S. j3, j11; L.C.S. m8) and thematic rules (F.O.S. m9, u3);

b) disagreement because of the amount of details (L.C.S. j7; F.O.S. u6); clarity (L.C.S. m1; F.O.S. m2, m11) and error (F.O.S. u4. *how can they be exactly as you see them without minute details?*). Thematic associations for details were literal (E.C.S. j3; j11; L.C.S. j7, m1; F.O.S. m2, m11, u4, u6,) and psychological (E.C.S. j3. *fashion*; L.C.S. m9. *flatter*; u3. *attractive*; u5. *bothered*).

In relation to genius four subjects made thematic associations for:

a) agreement based on the amount of time to imagine a realistic picture (L.C.S. m8), and *a good picture* (F.O.S. u4)

b) disagreement because of the lack of clarity (L.C.S. m6; F.O.S. m2).

Thematic associations for genius were literal (L.C.S. m6; F.O.S. m2, u4) and psychological (L.C.S. m8) It was assumed that literal (L.C.S. m5. *exactly we see them*; m5; F.O.S. u2. *that's right*) and psychological (L.C.S. m4. *a bit of a genius*) assertions were thematic.

The technical reasons for agreement and disagreement were as follows. In relation to details seven subjects made technical comparisons for:

a) agreement with formal elements (L.C.S. j5) and technical rules (skill, E.C.S. j10; L.C.S. j9; F.O.S. u5; *interest* F.O.S. m7);

b) disagreement with formal elements (E.C.S. j2. *not looking at the lines*), and technical rules for clarity (the amount of detail) used to identify error, F.O.S. u7).

The associations with details were literal (E.C.S. j2;) and psychological (E.C.S. j10; F.O.S. u5: *not bothered* ; L.C.S. j5. *nice* ; j9. *wrong*; F.O.S. m7. *boring*; u7. *attention*).

In relation to genius five subjects made technical associations for:

a) agreement with technical rules (*imaginative*, E.C.S. j1; skill, E.C.S. j6, m3; F.O.S. m1);

b) disagreement based on a similar amount (L.C.S. m5) and *standard* (F.O.S. u2) of other artworks.

The technical associations for genius were literal (E.C.S. j6; L.C.S. m5) and psychological (E.C.S. j1. *imaginative*; m3. *complicated*; F.O.S. m11. *experience*).

Subjects made comparative analyses of critical comments based on literal and psychological associations for thematic and technical agreement and disagreement. In general agreement was supported by similar examples and disagreement by different examples. The categories for three operational levels indicated that this ability had a tripart structure. However, agreement/disagreement with critical comments depended on the subjects understanding of the concepts i.e. details, genius.

6.2.5.3. Summary of the Testing of the Tripart Structure of the Art-Historical Abilities.

Data analysis indicated that the art-historical abilities could be assessed according to the complexity of the literal and psychological associations, for thematic and technical responses. However, associations with time were implicit and explicit. Therefore, these abilities would require defining by the question.

6.2.6. The Tripart Structure of the Reflective Abilities.

Data analysis of the reflective abilities was based on previous assessments. Two abilities were assessed with the interpretative (to revise interpretations) and the evaluative abilities (to comparatively evaluate the merits of several artworks) and were found to have a tripart and bipart structure respectively. The remaining abilities were given a collective assessment i.e. the abilities to use a critical strategy, give explanations for visual and contextual abilities and give reasons for preference judgements. However, subjects from all operational levels were able to

give responses for these abilities. Therefore, all of these remaining abilities were considered to have a tripart structure. However, collective assessments could not account for exceptions i.e. abilities with bipart and mono structures.

6.2.7. The Testing of the Tripart Structure of All of the Art Critical Abilities.

The collective findings for the hypothetical testing of the tripart structure of art critical abilities are shown in Figure 30 for the descriptive and analytic abilities; Figure 31 for the interpretive abilities; Figure 32 for the evaluative abilities, and Figure 33 for the reflective abilities and Figure 34 contextual abilities. The total number of tripart, bipart and mono structures are shown in Table 5. However, confirmation of the modal projections for the matrix and measure is undertaken in the following chapter (Chapter 7).

The operational structure of the seventy abilities was tested through evidence of modal raw scores at: three (tripart), two (bipart) and one (mono) level of development as shown in Appendix VII. It was found that:

- 1) Fifty-six abilities had a tripart structure;
- 2) thirteen abilities had a bipart structure with:
 - i. two lower level structures (the interpretative ability (F3.) to infer the pleasing qualities; the reflective ability (R3.) to comparatively evaluate the merits of several artworks);
 - ii. eleven higher level structures (the descriptive ability (D1.) to name items; the interpretive abilities (U5.) to relate the contents to events and theories and (H2/5.) identify a title and give an alternative interpretation; the intentional abilities to

FIGURE 30.

THE FINDINGS FOR THE TRIPARTITE STRUCTURE OF DESCRIPTIVE AND ANALYTIC ABILITIES.

CRITICAL ABILITIES.	DATA ANALYSIS STRUCTURE	CONFIRMATION HYPOT HESIS	MEAS SURE	MAT RIX
DESCRIPTIVE ABILITIES.				
1. name items.	bipart	no	no	no
2. name formal elements.	-	-	-	-
3. to name the position.	tripart	yes	yes	yes
4. to name tools and materials.	tripart	yes	yes	yes
5. to use generalised definitions.	tripart	yes	no	no
.....				
ANALYTIC ABILITIES..				
Subject Matter				
1. to decode signs in literal terms.	tripart	yes	yes	yes
2. symbolic decoding.	no testing.	-	-	-
3. to infer thoughts.	tripart	yes	yes	yes
4. to infer feelings.	tripart	yes	no	no
5. to infer a real-scene	tripart	yes	yes	yes
6. infer moods/atmospheres	tripart	yes	no	no
Formal Elements.				
1. to decode physical qualities.	tripart	yes	yes	yes
2. to identify textures.	tripart	yes	yes	yes
3. to decode abstract qualities.	tripart	yes	no	no
4/5. to infer emotive qualities from colour.	tripart	yes	no	no
Structure.				
1. to identify realistic spatial projections.	tripart	yes	yes	yes
2. to infer schematic links				
a) arrangements	tripart	yes	yes	yes
b) focal points				
i. main things	tripart	yes	no	no
ii. Importance	tripart	yes	no	no
iii. main elements	tripart	yes	yes	yes
c) colour scheme	tripart	yes	no	no
d) movement	tripart	yes	yes	yes
Treatment				
1. to identify techniques	tripart	yes	yes	yes
2. to describe the use of formal elements	tripart	yes	yes	yes
3. decode a realistic treatment.	tripart	yes	yes	yes
4. decode an emotive treatment	tripart	yes	no	no
5. decode an abstract treatment	tripart	yes	no	no
6. decode a decorative treatment	tripart	yes	yes	yes
7. decode differences between artworks	tripart	yes	yes	yes
8. differentiate between real and imagined.	tripart	yes	yes	yes

FIGURE 31.

THE FINDINGS FOR THE TRIPARITE STRUCTURE OF THE INTERPRETIVE ABILITIES..

CRITICAL ABILITIES	DATA ANALYSIS STRUCTURE	CONFIRMATION OF HYPOT HESIS	MESA SURE	MAT RIX
INTERPRETIVE ABILITIES.				
A) FUNCTIONAL ABILITIES				
1. to relate appearance and function.	tripart	yes	yes	yes
Utilitarian Functions.				
1. to infer a literal theme.	tripart	yes	yes	yes
2. to infer a symbolic theme	no testing.			
3. to associate real-space and narrative theme	tripart	yes	yes	yes
4. to infer the life imitated.	tripart	yes	yes	yes
5. to infer a social theme or message	tripart	yes	yes	yes
6. to relate contents to events and theories.	bipart	no	yes	yes
Expressive Functions.				
1. to infer the emotions communicated	tripart	yes	no	no
2. to infer an emotive theme from the subject- matter	tripart	yes	no	no
3. to infer emotions from the techniques	tripart	yes	no	no
4. to associate spatial relations with emotions.	no testing			
Formalist Functions.				
1. to infer analogous themes	tripart	yes	no	no
2. to infer a united composition	tripart	yes	yes	yes
3. to infer the production of pleasing qualities.	bipart	no	no	no
4. to infer the solution to a design problem	tripart	yes	no	no
B) HOLISTIC ABILITIES				
1. to identify a theme	tripart	yes	no	no
2. to identify a title	bipart	no	yes	yes
3. give an alternative interpretation.	bipart	no	yes	yes
4. to select and make a functional interpretation.	tripart	yes	yes	yes

FIGURE 32.

THE FINDINGS FOR THE TRIPARTITE STRUCTURE OF THE EVALUATIVE ABILITIES.

CRITICAL ABILITIES	DATA ANALYSIS CONFIRMATION OF:			
	STRUCTURE	HYPOT HESIS	MEAS URE	MAT RIX
EVALUATIVE ABILITIES.				
A) FUNCTIONAL ABILITIES.				
1. to identify a similar function.	tripart	yes	yes	yes
2. to evaluate a composition.	tripart	yes	no	no
3. to evaluate technical merit as accuracy.	tripart	yes	yes	yes
4. to evaluate the use of materials.	tripart	yes	no	no
5. to evaluate the solution to a design problem.	no testing			
6. to evaluate originality.	tripart	yes	no	no
B) PREFERENCE ABILITIES				
7. to evaluate pleasing qualities.	tripart	yes	yes	yes

FIGURE 33.

THE FINDINGS FOR THE TRIPARTITE STRUCTURE OF THE REFLECTIVE ABILITIES.

CRITICAL ABILITIES.	DATA ANALYSIS STRUCTURE	CONFIRMATION OF:		
		HYPOT HESIS	MEAS URE	MAT RIX
REFLECTIVE ABILITIES.				
1. to use a critical strategy.	tripart	yes	yes	yes
2. to revise interpretations.	tripart	yes	no	no
3. to comparatively evaluate merits.	bipart	no	no	no
4. to give a 'best fit' evaluation.	no testing.			
5. to give explanations for visual abilities.	tripart	yes	yes	yes
6. to give explanations for contextual abilities.	tripart	yes	yes	yes
7. to give reasons for preference judgments.	tripart	yes	yes	yes

FIGURE 34.

THE FINDINGS FOR THE TRIPARTITE STRUCTURE OF THE CONTEXTUAL ABILITIES.

CRITICAL ABILITIES.	DATA ANALYSIS STRUCTURE	CONFIRMATION OF:		
		HYPOT HESIS	MEAS SURE	MAT RIX
A) INTENTIONAL ABILITIES:				
1. to relate planning to artist's production.	tripart	yes	yes	yes
2. to infer reasons for the artist's intention.	tripart	yes	no	no
3. to relate intentions to visual cues.	bipart	no	yes	yes
4. to compare own and artist's intention.	bipart	no	yes	yes
5. to identify difficulties in comprehension.	bipart	no	yes	yes
B) STYLISTIC ABILITIES.				
1. infer the name of the artist.	bipart	no	no	no
2. infer the date of the artwork.	tripart	yes	no	no
3. infer the country of origin.	tripart	yes	yes	yes
4. differentiate past and present art.	tripart	yes	yes	yes
5. classify by art movements.	mono	no	yes	yes
C) HISTORICAL ABILITIES				
1. to recognise why artworks change over time.	tripart	yes	no	no
2. to infer the art production at the time.	tripart	yes	no	no
3. to recall knowledge of an artist's life.	bipart	no	yes	yes
4. to use knowledge of an artist's life to understand the artwork.	bipart	no	yes	yes
5. to infer the life at the time of production.	tripart	yes	no	no
6. to validate inferences about the historical context.	bipart	no	yes	yes
7. to comparatively evaluate critical merit.	tripart	yes	yes	yes

TABLE 5

THE TOTAL NUMBER OF TRIPART, BIPART AND MONO STRUCTURES FOR THE DESCRIPTIVE, ANALYTIC. INTERPRETATIVE, EVALUATIVE CONTEXTUAL AND REFLECTIVE ABILITIES.

1.The Visual Abilities	Tripart	Bipart	Mono
	Structure	Structure	Structure
4 Descriptive Abilities	3	1	-
20 Analytic Abilities	20	-	-
17 Interpretive Abilities	13	4	-
6 Evaluative Abilities	6	-	-
.....			
2. The Contextual	Tripart	Bipart	Mono
Abilities	Structure	Structure	Structure
17 Contextual Abilities	9	7	1
.....			
3. The Reflective	Tripart	Bipart	Mono
Abilities	Structure	Structure	Structure
6 Reflective Abilities	5	1	-
.....			
Total Operational Structures.	56	13	1
.....			

(3/4/5) relate intentions to visual cues, compare one's own response with the artist's intention and identify difficulties in comprehension; the stylistic ability (1) to infer the name of the artist; the art historical abilities to (3) recall knowledge of the artist's life, (4) use knowledge to understand the artwork (6) validate historical references);

3) one ability had a mono structure (stylistic ability (5) to classify by art movements).

Therefore, the hypothesis was accepted with the reservation that some abilities could have bipart or mono structures.

The modal operational scores for each sample provided the data for testing the operational relation with Piagetian measures and the objectivity of the modal measure. However, there were the following inconsistencies in the scoring procedures for the tripart abilities:

- a) a joint score for the abilities to infer thoughts and feelings;
- b) three abilities with more than one score (to infer schematic links, the date and country of origin);
- c) sixteen abilities with a combined score (Appendix VII) which tended to give a higher rating and changed individual tripart scores for the abilities to infer the life imitated and a social message into a bipart structure.

6.3. The Testing of the Operational Structure of Art Critical Abilities.

The hypothesis that there would be an operational relation between the critical abilities and the Piagetian measures was tested separately for the modal measure and the four phases of the critical strategy. Several abilities were omitted from the testing, because of:

- a) an unrepresentative sample (abilities to decode abstract qualities, infer an analogous theme);
- b) no emotive association (abilities to name emotions from colour);
- c) multiple scores (the reflective abilities to use a critical strategy; to give explanations for visual and contextual abilities; to give reasons for preference);
- d) partial scores from other abilities (evaluate technical merit).

6.3.1. The Operational Relation for the Modal Measure.

An operational relation with the modal structure of the art critical abilities was indicated by evidence of a correspondence between the dominant modal score and the operational level of the sample i.e.

E.C.S a greater number of early concrete scores;
L.C.S a greater number of late concrete scores;
F.O.S a greater number of formal scores.

This was based on the assumption that subjects would respond most frequently in the operational level determined by the operational test. Different combinations of corresponding scores from all three samples were used to indicate an operational relation with:

- a) the tripartite structure: corresponding scores from all three samples;
- b) the bipart structure: corresponding scores from two samples, with one operational score omitted by all three samples;
- c) the mono structure: a corresponding score for the formal sample, with formal scores from the other samples.

The raw data for each sample was derived from Appendix VII. and recorded in tables of operational responses for each ability (Tables 6-13). Data analysis of the operational relation was undertaken separately for the tripart, bipart and mono structures.

6.3.1.1. The Operational Relation for the Tripartite Structure.

Forty-five of the critical abilities determined as tripartite by the modal measure were tested. This included thirty-five visual abilities and ten contextual abilities. The tabulated raw scores for each ability and sample are shown in Tables 6, 7, 8,

9,10,11. The numbers in each sample were: E.C.S. 10; L.C.S. 10; F.O.S. 11. The confirmation of an operational relation from a correspondence between the highest modal score of each sample and the operational level of the sample is shown in Figures 35, 36. An operational relation was confirmed for all but one of the tripart abilities. The lack of confirmation for the ability to name moods and atmospheres was assumed to be due a poor understanding of the concepts for the two lower samples and an equal weighting of scores for the formal operational sample.

Only three abilities had the tripart structure confirmed by all three samples. The remaining forty-one abilities were partially confirmed by:

- a) the lower level samples for nineteen abilities, with $\frac{1}{4}$ of the ability to make schematic links (colour scheme) and $\frac{1}{2}$ the ability to infer the country;
- b) higher level samples for twenty abilities with $\frac{3}{4}$ of the ability to make schematic links (arrangements, focal point, movement) and $\frac{1}{2}$ the ability to infer the country.

It was assumed that partial correspondence with higher level samples indicated a more complex tripart structure

6.3.1.2. The Operational Relation for the Bipart Structure.

Fourteen abilities with a bipart structure determined by the modal measure, were tested. This included eight visual abilities and six contextual abilities. The tabulated raw scores for the bipart abilities are shown in Tables 12,13. The confirmation of the operational bipart structure from corresponding scores is shown in Figure 37. An operational relation was confirmed for all but two of the bipart structures. The two unconfirmed abilities were assumed to be due to:

TABLE 6

THE MODAL RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE DESCRIPTIVE ABILITIES WITH A TRIPART STRUCTURE.

D3. to name the position.						D4. to name tools, materials					
Sample	Modal Score					Sample	Modal Score				
	ECO	LCO	FO	N	V		ECO	LCO	FO	N	V
ECS	7	2	-	1	-	ECS	2	6	2	-	-
LCS	-	7	1	2	-	LCS	2	7	-	-	1
FOS	-	9	2	-	-	FOS	-	9	2	-	-
Total	7	18	3			Total	4	22	2		

D5. generalised definitions.					
Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	6	1	-	3	-
LCS	3	4	3	-	-
FOS	1	1	9	-	-
Total.	10	6	12		

TABLE 7

THE MODAL RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE ANALYTIC ABILITIES WITH A TRIPART STRUCTURE: SUBJECT MATTER, FORMAL ELEMENTS, STRUCTURE.

ASM1. decode literal signs.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	1	9	-	-	-
LCS	-	6	4	-	-
FOS	-	3	8	-	-
Total.	1	18	12		

ASM3/4. infer thoughts/ feelings.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	4	3	1	1	1
LCS	1	7	-	2	-
FOS	-	4	7	-	-
Total	5	14	8		

ASM5. infer a real scene.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	3	6	1	-	-
LCS	2	5	3	-	-
FOS	1	6	4	-	-
Total.	6	17	8		

ASM6. infer moods-atmosphere.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	-	1	8	1
LCS	1	1	2	5	1
FOS	1	5	5	-	-
Total.	2	6	8		

AFE1. decode physical properties.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	5	4	-	1	-
LCS	1	8	1	-	-
FOS	-	6	5	-	-
Total.	6	18	6		

AFE2. identify texture.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	4	3	1	1	1
LCS	7	3	-	-	-
FOS	-	9	2	-	-
Total	11	15	3		

AS1. infer spatial projections.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	3	5	1	-	1
LCS	2	3	5	-	-
FOS	-	-	11	-	-
Total.	5	8	17		

AS2. infer schematic links:

a) arrangements.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	1	5	1	3	-
LCS	1	3	1	5	-
FOS	-	2	9	-	-
Total.	2	10	11		

AS2. infer schematic links:

b) focal points

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	5	5	-	-	-
LCS	2	5	3	-	-
FOS	-	1	10	-	-
Total.	7	11	13		

AS2. infer schematic links:

c) colour scheme.

Sample	Modal Score				
	ECO	LCO	FON	V	
ECS	4	6	-	-	-
LCS	2	7	1	-	-
FOS	-	8	2	1	-
Total.	6	21	3		

AS2. infer schematic links:

d) movement

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	3	7	-	-	-
LCS	-	9	1	-	-
FOS	1	4	6	-	-
Total	4	20	7		

TABLE 8

THE MODAL RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE ANALYTIC ABILITIES WITH A TRIPART STRUCTURE: TREATMENT.

AT1. identify techniques.						AT2. use of formal elements.					
Sample Modal Score						Sample Modal Score					
	ECO	LCO	FO	N	V		ECO	LCO	FO	N	V
ECS	4	4	2	-	-	ECS	5	4	1	-	-
LCS	-	8	1	1	-	LCS	1	8	1	-	-
FOS	-	7	4	-	-	FOS	-	6	5	-	-
Total.	4	19	5			Total.	6	18	6		
AT3. realistic treatment.						AT4. emotive treatment.					
Sample Modal Score						Sample Modal Score					
	ECO	LCO	FO	N	V		ECO	LCO	FO	N	V
ECS	2	7	1	-	-	ECS	2	5	1	-	-
LCS	-	5	5	-	-	LCS	-	5	5	-	-
FOS	-	-	11	-	-	FOS	-	4	7	-	-
Total.	2	12	17			Total	.2	14	13		
AT5. abstract treatment.						AT6. decorative treatment.					
Sample Modal Score						Sample Modal Score					
	ECO	LCO	FO	N	V		ECO	LCO	FO	N	V
ECS	5	5	-	-	-	ECS	6	3	1	-	-
LCS	2	5	3	-	-	LCS	1	8	1	-	-
FOS	-	6	5	-	-	FOS	1	6	4	-	-
Total.	7	16	8			Total.	8	17	6		
AT7. differentiate between artworks.						AT8. differentiate real and imagined artworks.					
Sample Modal Score						Sample Modal Score					
	ECO	LCO	FO	N	V		ECO	LCO	FO	N	V
ECS	3	4	2	1	-	ECS	4	4	2	-	-
LCS	1	6	-	-	-	LCS	-	6	4	-	-
FOS	-	6	5	-	-	FOS	-	3	9	-	-
Total.	4	16	10			Total.	4	13	15		

.....

TABLE 9

THE MODAL RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE INTERPRETIVE ABILITIES WITH A TRIPART STRUCTURE.

IU1. a literal theme.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	1	5	-	4	-
LCS	1	1	4	4	-
FOS	-	2	8	1	-
Total.	2	8	12		

IU2. real space with narrative theme.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	9	-	1	-
LCS	2	7	1	-	-
FOS	-	3	8	-	-
Total	2	19	9		

IE1. emotions communicated.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	4	5	-	1	-
LCS	1	7	2	-	-
FOS	-	4	7	-	-
Total.	5	16	9		

IE2. emotions from subject matter.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	4	4	-	-	2
LCS	3	5	2	-	-
FOS	-	4	7	-	-
Total.	7	13	9		

IE3. emotions from techniques.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	3	2	-	4	1
LCS	1	6	2	1	-
FO	1	8	1	1	-
Total.	5	16	3		

F2/4. united composition/ solution to a design problem.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	3	7	-	-	-
LCS	1	4	5	-	-
FOS	-	1	10	-	-
Total.	4	12	15		

IH1/2. make interpretation/
identify a theme.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	5	-	5	-
LCS	-	7	1	1	1
FOS	1	6	4	-	-
Total.	1	18	5		

IH5. revise interpretations.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	2	4	-	3	1
LCS	-	7	1	2	-
FOS	-	4	3	4	-
Total.	2	15	4		

TABLE 10

THE MODAL RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE EVALUATIVE AND INTENTIONAL ABILITIES WITH A TRIPART STRUCTURE.

EVALUATIVE ABILITIES.

E1. identify a similar function.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	5	2	1	1	1
LCS	2	5	2	1	-
FOS	-	7	4	-	-
Total.	7	14	7		

E2. evaluate a composition.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	3	7	-	-	-
LCS	-	6	4	-	-
FOS	-	4	7	-	-
Total.	3	17	11		

E4. use of materials

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	1	5	2	2	-
LCS	1	6	1	2	-
FOS	-	7	3	-	-
Total.	2	18	6		

E5. originality.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	2	4	1	3	-
LCS	-	8	2	-	-
FOS	-	2	9	-	-
Total.	2	14	12		

E7. pleasing qualities.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	6	4	-	-	-
LCS	2	4	4	-	-
FOS	-	3	8	-	-
Total.	8	11	12		

INTENTIONAL ABILITIES.

AI1. relate artist's planning to production.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	3	6	1	-	-
LCS	-	6	3	1	-
FOS	-	3	8	-	-
Total.	3	15	12		

AT2. artist's intention.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	2	5	-	3	-
LCS	1	6	2	1	-
FOS	-	5	5	1-	-
Total.	3	16	7		

AT3. Relate visual cues to intentions,

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	1	4	1	4	-
LCS	2	5	2	1	-
FOS	-	6	4	1-	-
Total.	3	15	7		

TABLE 11

THE RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE ART HISTORICAL ABILITIES WITH A TRIPART STRUCTURE.

SA2. infer the date.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	2	5	-	3	-
LCS	1	3	6	-	-
FOS	-	3	8	-	-
Total	3	11	14		

SA2. reasons for dating.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	2	5	-	3	-
LCS	1	2	7	-	-
FOS	-	2	9	-	-
Total.	3	9	16		

SA3. infer the country.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	3	5	-	2	-
LCS	-	7	-	3	-
FOS	2	7	2	-	-
Total.	5	19	2		

SA3. reasons for country.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	1	4	2	3	-
LCS	2	2	4	2	-
FOS	2	2	7	-	-
Total.	5	8	13		

SA4. differentiate past and present art.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	1	5	1	3	-
LCS	1	5	3	1	-
FOS	-	1	10	-	-
Total	.2	11	14		

HA1. recognise change over time.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	1	4	1	4	-
LCS	-	2	5	2	1
FOS	-	1	10	-	-
Total	1	7	16	5	9

HA2. infer contextual art production.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	2	2	-	6	-
LCS	2	5	-	3	-
FOS	1	2	3	5	-

HA5. infer contextual life.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	2	3	1	4	-
LCS	2	5	2	1	-
FOS	-	9	2	-	-
Total	14	17	5		

C1. evaluate critical merit.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	2	4	2	2	-
LCS	1	6	2	2	-
FOS	-	3	8	-	-
Total.	3	13	12		

FIGURE 35

CONFIRMATION OF THE TRIPART STRUCTURE FROM AN OPERATIONAL
CORRESPONDENCE OF SCORES FOR DESCRIPTIVE AND ANALYTIC ABILITIES.

	CORRESPONDING SCORES			CONFIRMATION		
	ECO	LCO	FO	TRIPART	PARTIAL	
					LOW	HIGH
DESCRIPTIVE ABILITIES.						
3. to name the position.	Y	Y	N			Y
4. to name tools and materials.	N	Y	N			Y
5. to use generalised definitions.	Y	Y	Y	Y		
ANALYTIC ABILITIES.						
Subject Matter.						
1. to decode signs in literal terms.	N	Y	N			Y
3. to infer thoughts.	Y	Y	Y	Y		
4. to infer feelings.	Y	Y	Y	Y		
5. to infer a real-scene.	N	Y	N			Y
6. infer mood/atmosphere.	N	N	N	-	-	-
Formal Elements.						
1. to decode physical qualities	Y	Y	N			Y
2. to identify textures.	Y	N	N			Y
Structure.						
1. to identify realistic spatial. projections	N	N	Y			Y
2. to infer schematic links						
a) arrangements	N	Y	Y			Y
b) focal points	N	Y	Y			Y
c) colour scheme.	N	Y	N		Y	
d) movement	N	Y	Y			Y
Treatment						
1. to identify techniques	N	Y	N			Y
2. to describe the use of formal elements.	Y	Y	N			Y
3. decode a realistic treatment	N	N	Y			Y
4. decode an emotive treatment	N	N	Y			Y
5. decode an abstract treatment	N	Y	N		Y	
6. decode a decorative treatment	Y	Y	N		Y	
7. decode differences between artworks.	N	Y	N		Y	
8. differentiate between real and imagined artworks.	N	Y	Y			Y

FIGURE 36.

CONFIRMATION OF THE TRIPART STRUCTURE FROM AN OPERATIONAL
CORRESPONDENCE OF SCORES FOR INTERPRETIVE, EVALUATIVE AND
CONTEXTUAL ABILITIES.

	CORRESPONDING CONFIRMATION SCORES			TRIPART PARTIAL	
	ECO	LCO	FO	LOW	HIGH
INTERPRETIVE ABILITIES					
U1. to infer a literal theme	N	N	Y		Y
U3. to associate real-space and narrative theme.	N	Y	Y		Y
E1. to infer the emotions.	N	Y	Y		Y
E2. to infer an emotive theme from the subject- matter.	N	Y	Y		Y
E3. to infer emotions from the techniques.	Y	Y	N	Y	
F2. to infer a united composition	N	N	Y		Y
4. to infer the solution to a design problem.	N	N	Y		Y
H1. to select and make a functional interpretation.	N	Y	N		Y
H2. to identify a theme.	N	Y	N		Y
H5. to revise the interpretations	N	Y	N		Y
.....					
EVALUATIVE ABILITIES.					
1. to identify a similar function	Y	Y	N	Y	
2. to evaluate a composition	N	Y	Y		Y
4. to evaluate materials.	N	Y	N	Y	
6. to evaluate originality	N	Y	Y		Y
7. to evaluate the pleasing qualities.	Y	N	Y	Y	
.....					
CONTEXTUAL ABILITIES.					
AI1. to relate planning to the artist's production.	N	Y	Y	Y	
AI2. to infer reasons for the artist's intention.	N	Y	N	Y	
AI3. to relate intentions to visual cues.	Y	Y	N	Y	
SA2. infer the date:	N	N	Y		Y
reasons for date:	N	N	Y		Y
SA3. infer the country:	N	Y	N	Y	
reasons for country:	N	N	Y		Y
S4.differentiate past and present art.	N	Y	Y		Y
AH1. to recognise why artworks change over time.	N	N	Y		Y
AH2. to infer the art production at the time.	N	Y	Y		Y
AH5. to infer the life at the time of production.	N	Y	N	Y	
C1. to comparatively evaluate critical merit.	N	Y	N	Y	
.....					

TABLE 12.

THE MODAL RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE DESCRIPTIVE, INTERPRETIVE ABILITIES WITH A BIPART STRUCTURE.

DESCRIPTIVE ABILITIES

D1. to name items.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	9	1	-	-
LCS	-	8	2	-	-
FOS	-	2	9	-	-
Total.	-	19	12		

INTERPRETIVE ABILITIES.

U3/4. life imitated/ social message.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	8	2	-	-
LCS	-	6	4	-	-
FOS	-	1	10	-	-
Total	-	15	16		

U5. events and theories.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	1	-	9	-
LCS	-	4	1	5	-
FOS	-	1	3	7	-
Total.	-	6	4		

F3. infer pleasing qualities.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	8	2	-	-	-
LCS	3	7	-	-	-
FOS	5	5	-	-	-
Total.	16	14	-		

H3. identify a title.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	4	-	6	-
LCS	-	1	1	8	-
FOS	-	6	3	2	-
Total.	-	11	4		

H4. give an alternative interpretation.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	1	-	9	-
LCS	-	-	1	9	-
FOS	-	2	2	7	-
Total.	-	3	3		

EVALUATIVE ABILITIES.

R3. evaluate several artworks.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	8	2	-	-	
LCS	3	7	-	-	
FOS	5	6	-	-	
Total.	16	15	-		

.....

TABLE 13.

THE MODAL RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE
CONTEXTUAL ABILITIES WITH A BIPART STRUCTURE..

AI4. compare intentions.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECO	-	3	1	5	1
LCS	-	4	3	2	-
FOS	-	3	6	2	-
Total.	-	10	10		

AI5. identify comprehension difficulties.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	5	-	4	-
LCS	-	5	1	4	-
FOS	-	4	3	4	-
Total.	-	14	4		

SA1. infer the artist.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	1	-	9	-
LCS	-	4		5	1
FOS	-	6	2	3	-
Total.	-	10	2		

AH3. recall knowledge of artist's life.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	-	1	9	-
LCS	-	4	-	6	-
FOS	-	1	4	6	-
Total.	-	5	5		

AH4. use knowledge of the artist to
understand the artwork.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	1	-	9	-
LCS	-	4	-	5	1
FOS	-	6	2	3	-
Total.	-	11	2		

AH7. to validate historical inferences.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	1	-	9	-
LCS	-	5	1	4	-
FOS	-	8	3	-	-
Total.	-	14	4		

.....

FIGURE 37.

CONFIRMATION OF THE BIPART OPERATIONAL STRUCTURE, FROM AN OPERATIONAL CORRESPONDENCE OF SCORES OF DESCRIPTIVE, INTERPRETIVE EVALUATIVE AND CONTEXTUAL ABILITIES.

CRITICAL ABILITIES.	CORRESPONDING SCORES			CONFIRMATION	
	ECO	LCO	FO	BIPART	PARTIAL
DESCRIPTIVE ABILITIES.					
1. name items.	N	Y	Y	Y	
INTERPRETIVE ABILITIES.					
U4. to infer the life imitated	N	Y	Y	Y	
U5. to infer a social theme or message.	N	Y	Y	Y	
U6. to relate contents to events/theories.	N	Y	Y	Y	
F3. to infer the production of pleasing qualities.	Y	Y	N	Y	
H2. to identify a title	N	N	N	-	-
H3. give an alternative interpretation.	N	N	N	-	-
EVALUATIVE ABILITIES.					
R3. to comparatively the merits of several artwork.	Y	Y	N	Y	
CONTEXTUAL ABILITIES.					
I4. to compare own response and artist's intention.	N	Y	Y	Y	
I5. to identify difficulties in comprehension.	N	Y	N		Y
S1. infer the name of the artist.	N	Y	N		Y
H3. to recall knowledge of an artist's life.	N	Y	Y	Y	
H4. to use knowledge of an artist's life to understand the artwork.	N	Y	N		Y
H6. to validate inferences about the historical context.	N	Y	N		Y

- a) poor understanding of the concept for the ability to give a title;
- b) a lack of mental flexibility for the ability to give an alternative interpretation.

The remaining twelve bipart structures were:

1. fully confirmed for eight abilities with:

- a) the two lower level samples for two abilities (pleasing qualities, comparatively evaluate merits of several artworks);
- b) the two higher level samples for six abilities (name: life imitated, social message, items, events and theories; compare intentions, recall knowledge of the artist);

2. partially confirmed for four abilities with the late concrete sample (to identify difficulties in comprehension, infer the name of the artist; apply knowledge of artist's life, validate historical inferences).

Abilities confirmed with the two lower samples were regarded as less complex than tripart structures. The partial confirmations with the lower concrete sample and the full confirmations with the two higher level samples were regarded as more complex than the tripart structures.

6.3.1.3. The Operational Relation for the Mono Structure.

Only the ability to classify by art movements was identified as having a mono structure by the modal measure. The tabulated data (Table 14) and confirmation (Figure 38), indicated an operational correspondence for the one mono structure. Abilities with a mono structure were assumed to be the most complex abilities.

TABLE 14.

THE MODAL RAW SCORES FOR EACH OPERATIONAL SAMPLE FOR THE CONTEXTUAL ABILITY WITH A MONO STRUCTURE.

SA5. to classify by art movements.

Sample	Modal Score				
	ECO	LCO	FO	N	V
ECS	-	-	1	9	-
LCS	-	-	-	10	-
FOS	-	-	8	3	-
Total.	-	-	9		

FIGURE 38.

CONFIRMATION OF THE MONO OPERATIONAL STRUCTURE FROM AN OPERATIONAL CORRESPONDENCE OF SCORES FOR THE CONTEXTUAL ABILITIES.

	CORRESPONDING SCORES			CONFIRMATION MONO STRUCTURE
	ECO	LCO	FO	
SA5. classify into art movements.	N	N	Y	Y

6.3.1.4. The Operational Findings for the Modal measure.

The total number of confirmations for the tripart, bipart and mono structures are shown in Table 15.

TABLE 15

THE TOTAL NUMBER OF OPERATIONAL CONFIRMATIONS FOR THE TRIPART, BIPART AND MONO STRUCTURES.

STRUCTURE	TOTAL ABILITIES	CONFIRMED	PARTIAL	NO
tripart	45	3	41	1
bipart	14	8	4	2
mono	1	1	-	-

The hypothesis was accepted for the mono structure and partially accepted for the tripart and bipart abilities. The partial confirmations resulted from a lack of correspondence between the operational level of each sample and the dominant mode of thinking. The presence of other modes of thinking was assumed to be due

to the retention of parallel modes of thinking for higher level subjects, (Bruner, 1966) and the inability of the Piagetian measure to predict a dominant mode of thinking for each sample. Therefore, it was shown that subjects selected modes of thinking that were below or above their measured operational level.

6.3.2. The Operational Relation with Feldman's Critical Strategy.

An operational correspondence between Piaget's (1958) operational levels and Feldman's (1971) critical strategy, was examined through the operational structure of the critical abilities. It was assumed that there would be an increase in the complexity of the operational structure of art critical abilities for the more complex critical phases, so that:

- a) the descriptive abilities would have a greater number of tripartite structures:
- b) the analytic abilities would have a greater number of bipart structures;
- c) the interpretive and evaluative abilities would have a greater number of mono structures.

The total number and percentage of tripart, bipart and mono structures for each phase of the critical strategy determined by the modal measure are shown in Table 16. The three unconfirmed operational structures were removed (infer moods and atmospheres; identify a title, give an alternative interpretation), as were the two lower level bipart structures (pleasing qualities, compare merits of several artworks) in order to avoid confusion. In addition the totals included the contextual abilities, which were integrated with the analytic, interpretative and evaluative abilities, as shown in Figure 39.

TABLE 16

THE TOTAL NUMBER AND PERCENTAGE OF TRIPART, BIPART AND MONO OPERATIONAL STRUCTURES FOR THE FOUR PHASES OF FELDMAN'S CRITICAL STRATEGY.

CRITICAL PHASES	THE OPERATIONAL STRUCTURE						Total Number Abilities
	Tripart		Bipart		Mono		
Description	No.	%	No.	%	No.	%	
	3	75%	1	25%	-		4
Analysis	22	84%	3	11%	1	4%	26
Interpretation	13	65%	7	35%	-		20
Evaluation	6	86%	1	14%	-		7
.....							

Apart from the descriptive phase, there was a random distribution of tripart, bipart and mono structures, across the critical phases. Therefore:

a) the hypothesis was accepted for the descriptive phase, on the grounds that the bipart structure was discounted, because the question failed to isolate naming and inherent relations;

b) the hypothesis was partially accepted for the analytic phase, because of the presence of three bipart structures;

c) the hypothesis was rejected for the interpretive and evaluative phases, as no mono structures were present.

It was assumed that the random distribution of operational structures was due to the complexity of matching cognitive phases to operational levels in that:

a) the tautological component of the tripartite structure allowed analysis, interpretation and evaluation based on simple similarities, differences and physical

FIGURE 39

THE VISUAL AND CONTEXTUAL ABILITIES WITH TRIPART, BIPART AND MONO STRUCTURES FOR THE FOUR CRITICAL PHASES.

THE DESCRIPTIVE PHASE.

TRIPART STRUCTURE (3)

ABILITIES.

D3. to name the position of items.

D5. to use generalised definitions.

BIPART STRUCTURE (1)

ABILITIES

D1. to name items.

D4. to name tools and materials.

THE ANALYTICAL PHASE.

TRIPART STRUCTURE (22)

ABILITIES

ASM1. to decode signs in literal terms.

ASM4. to infer feelings.

FE1. to decode physical qualities.

AT1. to identify techniques.

AT2. to describe the use of formal elements.

AT3. decode an emotive treatment.

AT6. decode a decorative treatment.

AT8. differentiate between real and imagined artworks.

AI1. to relate planning to production.

SA2. infer the date.

SA4. differentiate past and present art.

BIPART STRUCTURE (3)

ABILITIES.

AI5. to identify difficulties in comprehension.

SA1. infer the name of the artist.

MONO STRUCTURE (1)

ABILITY

ASA5. classify into art movements.

ASM3. to infer thoughts.

ASM5. to infer a real-scene.

FE2. to identify textures.

S2. to infer schematic likes.

AT3. decode a realistic treatment.

AT5. decode an abstract treatment.

AT7. decode differences between artworks.

AI3. to relate intentions to visual cues.

SA3. infer the country.

AH1. to recognise why art- works change over time.

AH3. to recall knowledge of an artist's life.

THE INTERPRETIVE PHASE

TRIPART STRUCTURE (13)

ABILITIES.

U1. to infer a literal theme.

E1. to infer the emotions communicated.

E3. to infer emotions from the techniques.

F2. to infer a united composition.

H1. to make a functional interpretation.

H5. to revise the interpretations, in the light of visual evidence.

AI2. to infer reasons for the artist's intention.

AH2. to infer the art production at the time.

BIPART STRUCTURE (7)

ABILITIES.

U4. to infer the life imitated.

U6. to relate contents to events and theories.

H2. to identify a title.

AI4. to compare own and artist's intention.

AH4. to use knowledge of an artist's life to understand the artwork.

U3. to associate real space with a narrative theme.

E2. to infer an emotive theme from the subject-matter.

E4. to infer the solution to a design problem.

H2. to identify a theme.

AH5. to infer the life at the time of production.

U5. to infer a social theme or message.

H3. give an alternative interpretation.

THE EVALUATIVE PHASE.

TRIPART STRUCTURE (6)

ABILITIES.

E1. to identify a similar function.

E4. to evaluate the use of materials.

E7. to evaluate the pleasing qualities.

C1. to comparatively evaluate critical merit.

BIPART STRUCTURE (1)

ABILITY.

AH6. to validate inferences about the historical context.

E2. to evaluate a composition.

E6. to evaluate originality

cause;

b) bipart structures based on circumstantial and theoretical cognitive styles could be used for interpretation and evaluation;

c) the mono structure in the analytic phase indicated the ambiguous use of generalisations for analysis and interpretation.

However, the percentage scores for the analytic and interpretive phases indicated that an operational relation could be investigated through evidence of:

a) a decrease in the distribution of tripart abilities and:

b) an increase in the distribution of bipart abilities, across the critical phases.

6.4. The Testing of a Triangulation between Three Operational Measures.

The objectivity of the modal measure was hypothetically tested through evidence a triangulation between three operational measures. A table of all three test results is shown in Appendix X. An operational correspondence was indicated by similarities in subjects' modal and vocabulary scores for each operational sample.

The total raw scores from the modal and vocabulary tests for each subject were converted into percentages, because of differences in the number of items tested.

The measure for determining the three operational samples was previously described. The total raw and percentage scores from the modal and vocabulary tests for the subjects in each sample are shown in Table 17.

The raw data for determining test scores from a frequency count of the total number of valid responses, are shown in the Appendix (modal data, Appendix VII; vocabulary data, Appendix IX). There were however, the following inconsistencies in test scores (Table 17) that prevented direct comparisons

TABLE 17.

THE RAW AND PERCENTAGE SCORES FROM THE M.O.R.T AND A.A.V.T. FOR THREE OPERATIONAL SAMPLES.

1. THE TEST SCORES FOR THE EARLY CONCRETE SAMPLE.

Sex	F	M	F	F	M	F	M	F	M	F	
Subject	J1	J2	J3	J4	J6	J8	J10	J11	J12	M3.	
M.O.R.T.											MEAN
Raw Score	39	44	41	28	46	53	40	48	33	55	43
% Score	65	73	68	47	78	88	67	80	55	92	70%
A.A.V.T.											
Raw Score	37	45	32	37	37	31	42	44	18	44	38
% Score.	46	56	40	46	46	38	52	55	22	70	49%
% difference	19	17	28	1	32	50	25	25	33	22	21%

2. THE TEST SCORES FOR THE LATE CONCRETE SAMPLE.

Sex	M	M	M	M	M	F	M	M	M	F	
Subject.	J5	J7	J9	M1	M4	M5	M6	M8	M10	M12	
M.O.R.T.											MEAN
Raw Score	45	54	45	45	51	45	49	55	44	53	49
% Score	75	90	75	75	85	75	82	92	73	88	82%
A.A.V.T.											
Raw Score	43	48	40	57	53	34	48	62	54	54	49
% Score	54	60	50	81	66	43	60	77	68	68	62%
% difference	11	30	25	6	19	32	22	15	5	20	20%

3. TEST SCORES FOR THE FORMAL SAMPLE.

Sex	F	M	F	F	M	M	F	F	M	F	M	
Subject	M2	M7	M9	M11	U1	U2	U3	U4	U5	U6	U7	
M.O.R.T.												MEAN
Raw Score	54	54	57	52	58	57	51	54	57	53	57	55
% Score	90	90	95	87	97	95	85	90	95	88	95	92%
A.A.V.T.												
Raw Score	62	52	60	54	67	65	64	69	69	69	57	62
% Score	77	65	75	68	84	81	80	85	85	86	71	78%
% difference	13	25	20	19	13	14	5	5	10	2	24	14%

between the three operational measures:

- a) higher than average scores on the modal and vocabulary tests for some of the E.C.S. and L.C.S. which indicated that the Piagetian scale was unreliable for these samples;
- b) there was also a 15-20% differences in means of the modal and vocabulary test scores.

Therefore, a rudimentary operational scale (Table 18) was devised in order to compare operational levels and percentage test scores. Operational levels for each test were related to bands of percentage scores derived from the frequency of the distribution of test scores across the three operational samples. The confirmation of a triangulation was based on a correspondence between the bands of operational scores for the modal and vocabulary test as shown in Table 19.

The hypothesis for:

- a) the early concrete sample was partially accepted, with a correspondence for four subjects (j1, j3, j4, j12), and three borderline cases (j6, j10, j11);
- b) the late concrete sample was partially accepted, with a correspondence for one subject (m6), and three borderline cases (j5, j7, j9);
- c) the formal sample was fully accepted with a correspondence for all eleven subjects.

The borderline cases for the E.C.S. and L.C.S. were due to slight differences in operational levels of modal and vocabulary scores. Borderline differences were assumed to indicate transitional subjects. The lack of correspondence between modal and vocabulary scores for E.C.S. and L.C.S was due to:

TABLE 18

OPERATIONAL SCALE DERIVED FROM THE FREQUENCY DISTRIBUTION OF THE MODAL AND VOCABULARY SCORES FROM THREE OPERATIONAL SAMPLES.

% Scores for Triangulating Operational Levels.

	Early Concrete %	Late Concrete %	Formal %
A.A.V.T. 1% -----	50% : 51% -----	60% : 61% -----	100%
M.O.R.T. 1% -----	75% : 76% -----	85% : 86% -----	100%

TABLE 19.

CONFIRMATION OF AN OPERATIONAL TRIANGULATION, BASED ON CORRESPONDING BANDS OF OPERATIONAL SCORES.

1. Triangulation for the early concrete sample.

Subject	J1	J2	J3	J4	J6	J8	J10	J11	J12	M3.
Modal Score.	65	73	68	47	78	88	67	80	55	92
Band 1-75%	Y	Y	Y	Y	B	N	Y	B	Y	N
Vocab. Score.	46	56	40	46	46	38	52	55	22	70
Band 1-50%	Y	N	Y	Y	Y	Y	B	B	Y	N
Triangulation	Y	N	Y	Y	B	N	B	B	Y	N

2. Triangulation for the late concrete sample.

Subject.	J5	J7	J9	M1	M4	M5	M6	M8	M10	M12
Modal Score.	75	90	75	75	85	75	82	92	73	88
Band 76-85%	B	B	Y	Y	Y	B	Y	N	B	B
Vocab. Score.	54	60	50	71	66	43	60	77	68	68
Band 51-60%	Y	Y	B	N	N	N	Y	N	N	N
Triangulation	B	B	B	N	N	N	Y	N	N	N

3. Triangulation for the formal sample.

Subject	M2	M7	M9	M11	U1	U2	U3	U4	U5	U6	U7
Modal Score	90	90	95	87	97	95	85	90	95	88	95
Band 86-100%	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vocab. Score.	77	65	75	68	84	81	80	85	85	86	71
Band 61-100%	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Triangulation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y = yes; N = no; B = borderline (5% difference).

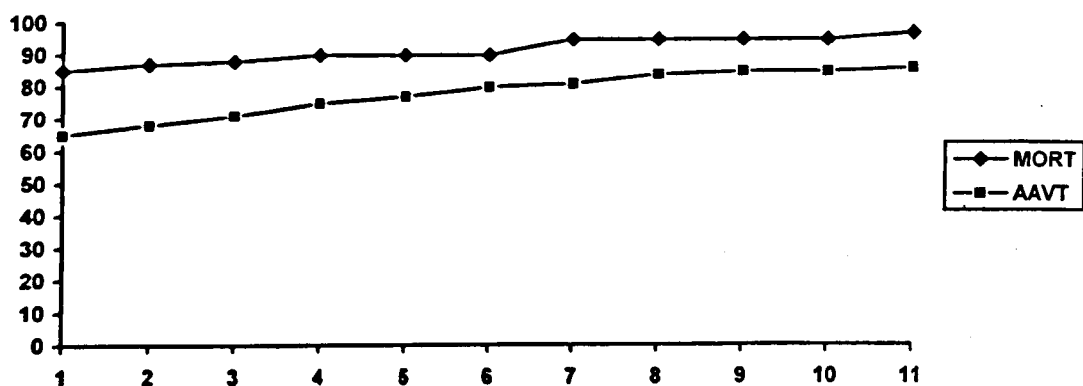
- a) lack of adequate differentiation of operational levels (Piagetian tests) as indicated by higher level scores for both tests (E.C.S. m3; L.C.S. m8);
- b) differences in operational levels of scores for vocabulary and operational judgements (higher: vocabulary, E.C.S. j1; L.C.S. m1, m4, m10, m12; lower vocabulary, L.C.S. m5. or higher modal operations E.C.S. j8 (F.O.)).

However, a standardised operational scale would be required to give an independent confirmation of the testing.

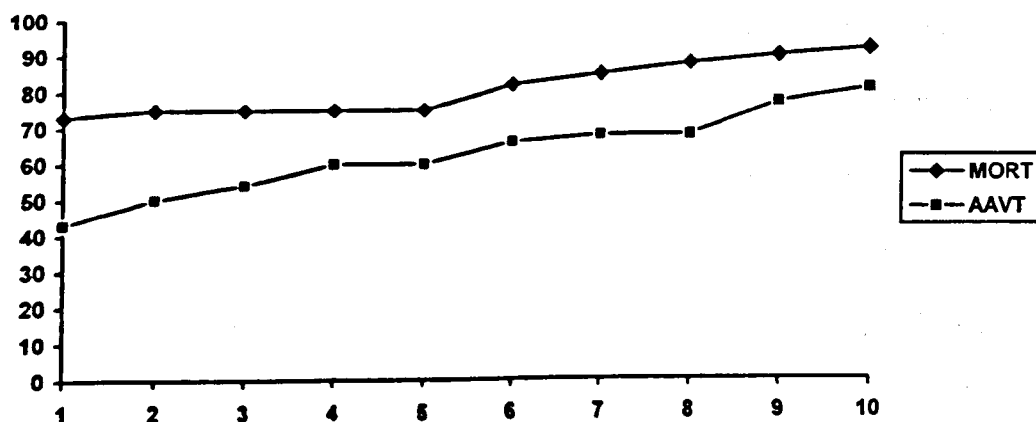
Greater confirmation of the objectivity of the modal measure was derived from evidence of an operational relation with the vocabulary test, which was validated by significant correlation's with a standardised test. An operational relation between total percentage test scores based on a twenty-five percent difference to standardise comparisons, was established for all three samples. The operational relation is shown in a linear graph (Figure 40) and the individual percentage scores for each sample (Table 17). A comparison of the individual percentage scores for the modal and vocabulary test (Table 17) confirmed a full correspondence for the F.O.S. and greater partial correspondence with the E.C.S (6) and L.C.S. (8). Similarly, lack of correspondence for the two lower level samples was due to differences in the operational level of vocabulary and reasoning test scores, apart from one subject (E.C.S. j12) whose higher modal score remained in the early concrete band.

FIGURE 40

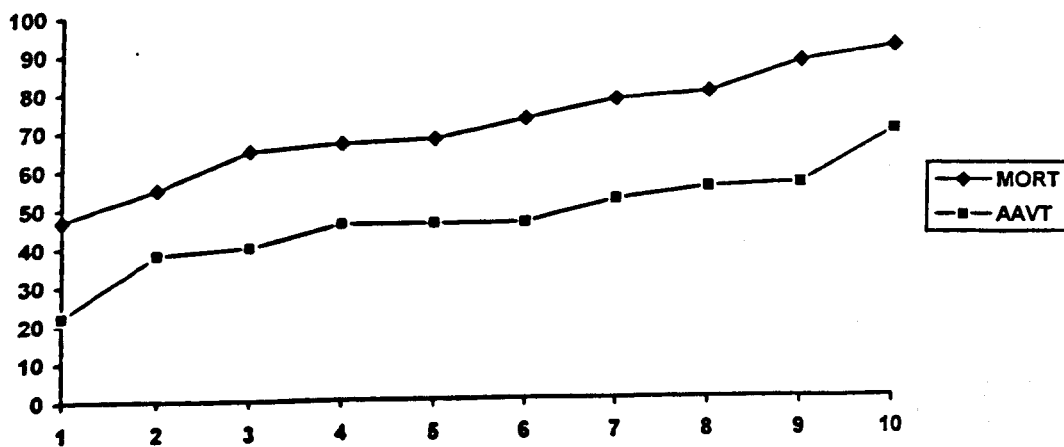
A LINEAR GRAPH OF THE PERCENTAGE SCORES FROM THE MORT AND AAVT FOR THREE OPERATIONAL SAMPLES



FORMAL OPERATIONAL SAMPLE



LATE CONCRETE SAMPLE



EARLY CONCRETE SAMPLE

6.5. Summary of the Hypothetical Testing.

Three hypotheses were tested using three operational measures. The selection of three operational samples from the three Piagetian measures (Elliot, 1983) preceded the description of the testing. The first hypothesis, that all critical abilities would have a tripartite structure was tested by the modal measure, through evidence of three operational levels of modal scores. The hypothesis was accepted for fifty-six of the seventy abilities, with the reservation that some abilities could have a bipart (thirteen) or mono structures (one).

The second hypothesis that there would be an operational relation with the art critical abilities was tested through an operational correspondence between the dominant modal score from each sample and the operational level of the sample. The hypothesis was partially accepted for the tripart structure, mainly accepted for the bipart structure, and fully accepted for the mono structure. However, an operational relation between increasingly complex operational structures and critical phases was difficult to establish. In both cases, hypothetical confirmations were undermined by the use of all three modes of response by the three operational samples across the four critical phases.

The third hypothesis that there would be a triangulation of three operational measures determined the objectivity of the modal measure. The hypothesis was tested though evidence of a correspondence between the individual percentage scores from the modal and vocabulary tests, for each operational sample. The hypothesis was fully accepted for the F.O.S. and partially for the E.C.S and L.C. S.

Partial correspondence was due to difficulties in determining the operational level of E.C.S. and L.C.S. and differences in the levels of vocabulary and reasoning test scores. However, a comparison of modal and vocabulary percentage scores, provided greater confirmation of an operational correspondence with the two lower level samples.

CHAPTER 7.

THE RESEARCH FINDINGS.

The research findings for the modal matrix and measure are considered for the projected operational structure of art critical abilities and the objectivity of the modal measure, followed by a comparison with the previous testing (Stuart, 1989).

7.1. The Projected Operational Structure of Art Critical Abilities.

The findings for the operational structure of art critical abilities will be described and related to the projected: operational structure for the matrix of conceptual development, the cognitive style of thinking, and the modal measure.

7.1.1. The Findings for the Operational Structure.

The findings from the modal testing of the operational structure confirmed that the seventy abilities tested had an increasingly complex operational structure, that could be related to the modal level of thinking (Figures 30, 31, 32, 33, 34). There were:

- a) two lower level bipart structures (early concrete and late concrete modes of thinking);
- b) fifty-six tripart structures (early concrete, late concrete and formal modes);
- c) eleven higher level bipart structure (late concrete and formal modes);
- d) one mono structure (formal modes).

The majority of art critical abilities were found to have a tripart structure, with some evidence of higher level structures. The findings indicated a 'spiral'

development of abilities (Bruner, 1966) which could be differentiated and therefore assessed through modes of thinking.

In relation to the findings of an operational relation between art critical abilities and operational levels of development, there was greater confirmation for each ability than the four art critical phases. This was assumed to be due to differences in the complexity of methods of determining agreement. Comparisons of the dominant mode of thinking with the operational level of the sample (Table 15) provided evidence of an operational relation with sixty-six of the sixty-nine abilities tested (forty-five) tripart abilities, fourteen bipart abilities and one mono ability). Most of the confirmations were partial (forty-four tripart structures; four bipart structures), because the modal responses were not in keeping with the operational level of the sample. This was due to:

- a) poor differentiation of the early and late concrete operational samples;
- b) transitional subjects, able to use higher modes of thinking;
- c) accumulative modes of thinking for the late concrete and formal operational samples.

Three abilities failed to show any relation between the modal score and the operational level of the sample (tripart: to infer moods and atmospheres; bipart: to give a title, to give an alternative interpretation). This was assumed to be due to the use of lower level modes by the formal sample and a lack of understanding or mental flexibility for the two lower level samples. The modal measure provided a means of identifying a mismatch between the dominant mode of thinking and the

operational level of the sample. Greater confirmation of an operational relation would require a more accurate differentiation of the operational samples.

The findings for an operational relation with the four critical phases, proved inconclusive. The assumption that the complexity of the operational structures increased with the complexity of the critical phases was only confirmed for the descriptive phase. The wide distribution of tripart structures across all of the critical phases indicated a conflict between the methods of determining the levels of cognitive functions for the critical phases and the concepts for each art ability. It was assumed that standardisation of the assessment procedures for abilities within a phase would provide evidence of a greater operational correspondence. However, further clarification would be required of the relation between operational, conceptual and cognitive development. In addition, the wide distribution of tripart structures across the critical phases could be indicative of a relative relation between the cognitive phases and operational levels i.e. three operational levels of concept formation or methods of processing information for each phase. Therefore, a relative relation would require evidence of a cross phase decrease in less complex operational structures, and an increase in more complex operational structures.

7.1.2. The Confirmation of the Modal Projections.

The modal projections for the matrix and measure were confirmed from the findings for the tripartite structure (Figures 30-34). However, there were differences between the findings (Table 20) and the operational projections (Table

21). Confirmation of the operational projections were given separately for each operational structure, and then for the visual, contextual and reflective abilities. The modal findings confirmed thirty-two and a half of the thirty-five and a half projected tripartite abilities. The three unconfirmed abilities were found to have a bipart structure and lacked:

1) an early concrete mode due to:

a) the inclusion of complex analysis for the ability to name items;

b) a focus on the style rather than the signature for the ability to name the artist;

2) a formal operational mode due to a focus on ordering the ranking of artworks for the ability to comparatively evaluate the merits of several artworks.

The modal testing confirmed eight of the thirty and a half projected bipart structures. The remaining twenty-two and a half abilities were found to have a tripart structure. The lack of confirmation for the bipart structures was due to the presence of limited conceptual understanding for:

a) generalised definitions:

b) inferring feelings, moods atmospheres, emotive use of colour, an emotive treatment or communication through the subject matter and techniques;

c) inferring abstract qualities and treatment;

d) inferring schematic links for focal points and colour schemes;

e) inferring themes, analogous themes, solutions to design problems and revising interpretations in the light of the visual evidence;

f) evaluating a composition, the use of materials and originality

g) relating intentions to visual cues and give reasons for intentions;

TABLE 20.

THE NUMBER OF OPERATIONAL STRUCTURES DETERMINED BY THE HYPOTHETICAL TESTING .

Number of Operational Structures.

Visual Abilities	Tripart	Bipart	Mono	Total Abilities
Descriptive	3	1	0	4
Analytic	20	0	0	20
Interpretive	14	4	0	18
Evaluative	7	1	0	8
.....				
Contextual Abilities	9	7	1	17
.....				
66 Total Structures	53	13	1	

TABLE 21.

THE NUMBER OF OPERATIONAL STRUCTURES PROJECTED FOR THE MODAL MATRIX AND MEASURE.

Number of Operational Structures.

Visual Abilities	Tripart	Bipart	Mono	Total Abilities
Descriptive	3	1	0	4
Analytic	13.5	6.5	1	20
Interpretive	8	10	0	18
Evaluative	5	3	0	8.
.....				
Contextual Abilities.	6	10	1	17
.....				
66 Total Structures	35.5	30.5	1	

Half abilities due to a split projection of the composite ability to infer schematic links: (tripart arrangements movement; bipart focal point, colour scheme).

h) inferring the date, recognising change overtime for artworks, and contextual inferences for art production and life at the time of production.

The findings indicated that several bipart abilities that required a complex understanding, could be understood in simple terms (McDonald, 1978). The modal testing confirmed that the ability to classify by style names had a mono structure. In general, the modal projections were confirmed for the tripart and mono structures, and one third of the bipart structures.

7.1.2.1. The Implications for The Matrix Projections.

In relation to the projected visual abilities, all of the tripart projections for the modal measure and matrix were retained (Table 21 29.5). This included the three unconfirmed abilities, which were regarded as unproved i.e. inappropriate responses for the ability to name items and no formal responses for the abilities to infer the pleasing qualities and comparatively evaluate the merits of several artworks.

Three of the bipart projections for the interpretive abilities were confirmed (to relate contents to events and theories, infer a title, give an alternative interpretation). Early concrete components were required for:

- a) the descriptive ability to give generalised definitions;
- b) to infer feelings, emotions from colour, abstract qualities, abstract and emotive treatments and half of the schematic ability (to infer focal points, colour schemes);

- c) the interpretive abilities to infer the emotions communicated from the subject matter and techniques, analogous themes, solutions to design problems, revise interpretations in the light of the visual evidence;
- d) the evaluative abilities to evaluate a composition the use of materials and originality.

In relation to the contextual abilities eleven of the seventeen matrix and modal projections were confirmed (Figure 34). The following six projections required adjusting. The tripart structure for the ability to name the artist required the removal of an early concrete mode. The bipart structure for five abilities (to give reasons for the artist's intention, relate intentions to visual cues, infer the date of an artwork, recognise why artworks change over time, infer art production at the time, infer life at the time of production) required the addition of an early concrete mode.

The greater proportion of bipart structures (Table 20: bipart 7/17, tripart 6/44) indicated that the contextual abilities were more complex than visual abilities. This was assumed to be due to the use of historical associations.

In relation to the reflective abilities all of the tripart projections were confirmed (abilities to use a critical strategy; give explanations for visual and contextual abilities; to give reasons for preferences). However, one of the bipart projections required an early concrete mode (ability to revise interpretations in the light of the visual evidence). The other lower level bipart structure for the ability to

comparatively evaluate the merits of several artworks was regarded as unproved as previously described. The findings indicated that critical reflection was possible at all operational levels of development.

7.1.3. The Projected Matrix of Conceptual Development.

Conceptual development in art was projected in two ways. Firstly, the cognitive development of key concepts across four art critical phases to define visual and contextual art abilities. Secondly, an operational structure was projected for each art critical ability, which will be considered through the findings for the cognitive style. A significant finding for conceptual development was that visual and contextual abilities had different methods of processing information across the four art critical phases. The key concepts identified the different kinds of information being processed i.e. visual key concepts: visual elements, structure, treatment; contextual key concepts: artist's intention, stylistic analysis, art history, contemporary criticism for three art functions (Utilitarian, Expressive, Formalist). A further key concept identified for visual abilities was the use of thematic and technical rules for relating form (analysis) and meaning (interpretation

Projecting key concepts across the four critical phases provided a means of co-ordinating the cognitive/conceptual development of visual and contextual abilities. The key concepts could also be used to develop an understanding of specific art functions and multi-functional comparisons. However, Utilitarian and Expressive thematic concepts would require analogous transfer to Formalist artworks. In

addition, multi-functional comparisons would be inappropriate for early concrete subjects.

In relation to visual abilities, the modal projections for each art function were confirmed in that:

- a) Utilitarian themes involved a literal or psychological decoding of the subject matter and composition with implicit references to a realistic treatment, using thematic or technical evaluations;
- b) Expressive themes involved a psychological decoding of the visual elements, composition and treatment, with thematic or technical evaluations
- c) Formalist techniques involved a technical decoding of the visual elements, composition and treatment, which could include non-formal styles, with a technical evaluation.

In relation to the contextual abilities, the three key concepts for contextual abilities developed through the same cognitive phases as visual abilities but involved greater use of historical information. However, the key concepts were not exhaustive or exclusive. There were overlaps between contextual key concepts and with the visual key concepts. All contextual abilities were multi-functional, in that historical associations could be applied to any art function or comparison of art functions. In addition, the visual abilities could be related to an historical context through themes and techniques. Therefore, a distinction was required between thematic and historical time.

7.1.4. The Projected Cognitive Style of Thinking.

The cognitive style of thinking for three modal levels was used to co-ordinate the projections for the development and assessment of the visual and contextual abilities across the critical phases. This was based on the assumption that the mode of thinking determined the operational level of concept formation and cognition (Piaget, 1968). However, the development of cognitive styles was found to be accumulative (Bruner, 1966) and not hierarchical (Piaget, 1958) as subjects retained earlier modes of thinking. A significant finding was that early concrete modes of thinking could be used to access most cross phase critical abilities, through simple/implicit comparisons with reality. Therefore, the projected simple use of a vocabulary of physical associations and causes or assertions, needed extending to include the previously described bipart abilities found to have a tripart structure e.g. analogies, emotions, intentions, abstract styles, and revising interpretations. However, generalisations e.g. perspective, colour schemes, moods, atmospheres, themes, would remain inaccessible. Subjects at this level would be able to undertake limited enquiries into Utilitarian, Formalist and Expressive functions. Poor time concepts would limit Contextual enquiries to simple themes and techniques in any context.

All of the projections were confirmed for the late concrete modes of thinking. The findings indicated that there was a shift to more complex vocabulary and physical relations with the start of circumstantial probability, hypothetical thinking, psychological relations and the monitoring of comprehension difficulties for themes, issues and techniques. Subjects at this level would be able to undertake

circumstantial enquiries for each art function, functional comparisons and contextual enquiry. Subjects would have difficulties classifying by styles and art movements.

All of the formal operational projections were confirmed apart from the abilities to infer the pleasing qualities and comparatively evaluate the merits of several artworks. This was assumed to be due to lack of evidence, rather than lack of ability. The findings indicated that formal modes involved: a greater number of comparisons and combined thematic- technical relations; abstract generalisations for themes, techniques and time, relative thinking, extended hypothetical thinking, reversals, the identification of error and humour. Subjects at this level were able to undertake theoretical multi-functional enquires, including contextual enquiry.

The findings indicated that subjects at all operational levels were able to undertake art critical enquiry. However, the quality of the enquiry depended on the level of conceptual and critical understanding. Theoretical modes of enquiry provided the closest correspondence with academic enquiry (Feldman, 1971; Eisner, 1979).

7.1.5. The Projected Modal Measure.

The findings from the testing of the tripart structure confirmed that the modal measure could be used to assess three operational levels of development. The modal measure rated three operational levels through tautological, circumstantial, theoretical modes of thinking, which were indicated by simple, complex and theoretical responses. There was a borderline rating to accommodate complex

concepts expressed in simple terms or inadequately. Invalid and negative responses were rated as void. Most subjects used late concrete modes of response. There was evidence that all operational levels could use formal operational responses, although the number of responses increased with the maturity of the sample (Tables 6 to 14). Formal operational responses from the early concrete sample tended to be abstract definitions and relative thinking.

The intention to base the modal assessment on the increasingly complex use of vocabulary was only appropriate for descriptive listing by name. Relational judgements and informational support required a combined assessment of vocabulary and relations, according to the most complex level of response. The A.A.V.T. (Allison, 1974) provided further evidence that levels of vocabulary and reasoning could differ. A more detailed summary of the findings for the assessment of the tripartite structure of the different phases of art abilities was given in the previous chapter (Chapter 6).

A main problem was the co-ordination of the assessment of functional and multi-functional responses. i.e. the visual and contextual responses for specific functions and cross functional comparisons. The modal measure provided evidence that the assessment of different functions could be co-ordinated through references to:

- a) thematic functions (Utilitarian, Expressive and analogous Formalist themes, related to the historical context);
- b) technical functions (Utilitarian, Expressive, Formalist manner of working, related to the historical context).

Most visual and contextual abilities required a dual assessment of thematic and technical responses. Therefore, critical abilities could be used and assessed for any of the three art functions.

The findings also confirmed that the operational level of thematic and technical responses could be assessed according to the complexity of the literal and psychological associations (Reid, 1969). Contextual abilities also required explicit or implicit associations with time. It was found that there was a cross-functional use of literal and psychological associations, rather than the use of specific associations for each function i.e. literal/Utilitarian; psychological/Expressive; technical/Formalist. Therefore, literal and psychological associations provided a functional and multi-functional assessment of art critical abilities..

It was found that the development and assessment of understanding in art needed to include:

- a) general knowledge for thematic understanding;
- b) technical knowledge for technical understanding;
- c) historical knowledge for contextual understanding.

Thematic knowledge, which did not require subject specific knowledge, was found to be the most accessible, followed by technical knowledge. Lack of subject specific historical knowledge was found to limit contextual enquiry.

The majority of subjects used literal associations with themes and techniques, based on comparisons with reality. Literal (spatial) associations were often a prerequisite for psychological associations e.g. temperature and emotive warmth, and

appropriate for early concrete levels. However, subjects at higher levels needed to develop psychological, stylistic and historical associations as argued by Eisner (1979, p337).

The intention to co-ordinate the assessment of critical abilities across the four art critical phases was incomplete, due to the exploratory nature of the study.

Assessment categories for three operational levels of response for each ability were provided (Appendix XI). The cross phase operational categories (tautological, circumstantial, theoretical) were co-ordinated through references to thematic and technical functions. There were additional categories for time, the artist's intention and hypothetical thinking. The categories for the analytic treatment, the interpretive, evaluative and contextual abilities had virtually the same assessment categories. However, analytic abilities for the visual elements and structure required a greater range of criteria, due to the diverse methods of enquiry. In addition, multi-functional assessment required an extension of the thematic categories to include thematic rules to accommodate combined references to form and meaning. Descriptive naming and dating required separate assessment procedures, because they used implicit relations.

In relation to the development of a cross phase measure, there was evidence that the assessment of technical functions could be co-ordinated, based on common references to techniques and processes. However, there were difficulties establishing a cross phase measure for the thematic functions or for specific art functions. This was because of the diversity of thematic and compositional

assessment procedures e.g. different assessments of people, objects, thoughts, feelings for Utilitarian themes.

Further standardisation of the cross phase assessment would require clearer definitions of the cognitive functions for each phase. This was because the accumulative nature of the strategy led to ambiguities i.e. description combined with analysis, interpretation and evaluation. The most ambiguous definition was for description and analysis, as both involved relational judgements. Therefore, it was recommended that:

- a) the descriptive distinction for pre-requisite abilities was retained on the matrix,
- b) description was assessed as naming or dating
- c) all relational judgements were assessed as analysis.

Clarification was also required of the ambiguous role of generalisations used to define interpretations, but also included in description and analysis. However, the modal measure accommodated overlaps in cognitive functions, because it assessed different levels of conceptual development within and across phases as shown in Figure 41.

7.2. Confirmation of the Objectivity of the Modal Measure.

The objectivity of the modal measure was confirmed through evidence of an inter-relation between Piagetian test scores, modal reasoning and art vocabulary.

However, a rudimentary operational scale was required to co-ordinate comparisons of all three measures, and an adjustment of twenty-five percent for comparisons of modal and vocabulary percentage scores. The confirmation was

FIGURE 41.

THE MODAL MEASURE OF CONCEPTUAL DEVELOPMENT.

Cognitive Phase	Operational Modes of thinking		
	ECO. Tautological	LCO. Circumstantial.	FO. Theoretical
Description Classification	Simple names, plurals,	Complex names plurals	Abstract definitions
Analysis	Simple literal relations.	Complex literal and psychological relations from different viewpoints, hypothetical thinking. probabilities	Abstract literal and psychological generalisations hypothetical thinking probabilities. relative thinking
Interpretation Synthesis	Simple literal generalisations	Complex literal and psycho- logical gen- eralisations. hypothetical argument probabilities	Abstract literal and psychological generalisations hypothetical argument probabilities relative thinking.
Evaluation	Simple ranking by amount, time and preference.	Complex ranking by order, time, quality, and functional comparisons.	Hypothetical functional evaluation.
Informational Support.	Literal comparisons. asserted or explicit physical cause	Literal and Psychological comparisons explicit and hypothetical	Theoretical literal and psychological comparisons hypothetical

accepted despite a partial confirmation of a triangulation of scores for the two lower level operational samples. The partial confirmations were due to the presence of scores above or below the operational level of the sample. These were due either to:

a) poor differentiation of the two lower operational samples (indicated by higher than average sample scores for the modal and vocabulary tests);

or

b) differences in the operational levels of modal and vocabulary scores.

The confirmation of the formal operational component of the modal measure indicated a correct differentiation of the formal operational level and a better balance of levels of vocabulary and reasoning with maturity. The comparison of modal and art vocabulary scores provided greater evidence of a correspondence for the two lower level samples than a triangulation of all three scores. Therefore, it was assumed that the modal measure and vocabulary tests provided a better measure of knowledge and understanding in art than Piagetian tests. However, the assessment procedures would require standardising, in order to provide reliable comparisons of levels of vocabulary and reasoning.

The findings extended the enquiry into the objectivity of the modal measure to consider the role of vocabulary in reasoned enquiry. The findings indicated that differences in the development of vocabulary and reasoning could account for lack of correspondence with Piagetian measures, which focused on logical thinking (Wood, 1988).

7.3. Summary of the Findings.

In general the findings indicated that operational development in art could be assessed through modes of reasoning. The findings confirmed the projections for the tripart structure of critical abilities, but several of the bipart structures required an early concrete component. Greater evidence of an independent operational relation was provided for the operational structure of each ability, rather than the four art critical phases. This was assumed to be due to the more complex matching of specific operational structures and phases than the simpler matching of modes to operational levels. The presence of different modes of thinking at different levels and phases indicated that operational relations required a relative assessment.

The significant findings from the testing of the operational structure were that:

- a) visual and contextual abilities used different but comparable methods of processing information;
- b) the development of visual and contextual abilities could be co-ordinated by projecting key concepts across four cognitive phases;
- c) the cognitive style, based on three modes of thinking could be used to co-ordinated the development and assessment of visual and contextual abilities;
- d) a multi-functional modal assessment of art critical abilities could be co-ordinated through the level of literal, psychological and time associations with themes and techniques
- e) the assessment procedures for each phase required further standardisation.

- f) subjects required general, technical and historical knowledge for adequate art critical enquiry;
- g) early concrete subjects could understand complex concepts expressed in simple terms, but Expressive and Contextual enquiries would be limited;
- h) older subjects could undertake enquiries for all three art functions and contextual enquiry, but needed to develop psychological, stylistic and historical methods of enquiry;
- i) theoretical methods of enquiry corresponded with academic methods of enquiry.
- j) reflective thinking was possible at all operational levels.

The objectivity of the modal measure was confirmed through a triangulation of operational test scores. However, partial confirmation of an operational relation with the two lower level operational samples indicated that poor operational differentiation and different operational levels of reasoning and vocabulary could account for a poor operational correspondence. In addition there was evidence that the vocabulary and modal test provided a better assessment of knowledge and understanding in art than Piagetian measures. However, the smallness of the sample prevented a generalisation of the findings to wider populations and would require further testing with larger samples

In relation to the previous findings (Stuart, 1989), the study confirmed that operational levels in art could be accessed through description, analysis, interpretation and evaluation for visual abilities. The present study found that the operational level of contextual abilities could be also be accessed through the use

of a critical strategy, but the methods of processing information differed. In both cases the hypothetical testing of an operational relation was undermined by poor differentiation of operational levels of development and the use of modes of thinking that were not in keeping with the operational level of the sample. The findings from the present study indicated that different levels of reasoning and vocabulary could be a factor in the lack of correspondence between modes of thinking and the operational level of the sample. The present study extended the enquiry in the operational development and assessment of critical abilities by providing:

- a) examples of three operational levels of critical response for each ability;
- b) generalised categories for assessing art critical development i.e. thematic and technical responses;
- c) evidence that critical abilities developed and could be assessed through increasingly complex literal/spatial and psychological associations.

CHAPTER 8.

CONCLUSIONS.

The research conclusions consider the value of the study in relation to the development of objective measures for the arts, national testing and critical thinking along with a criticism of the research methodology and suggestions for further research.

8.1. The Development of Objective Measures for the Arts.

The study contributed to the development of objective measures of intellectual development by examining the application of a multi-logical measure of the cognitive style of thinking to the subject area of art. A combined assessment of the objectivity of the response and the developmental level of reasoning was achieved through concept analysis of the operational level of explanations. The use of modes of thinking to assess levels of development provided a means of uniting linguistic and operational measures of development. It was assumed that modes of thinking determined the cognitive level of vocabulary and relational judgements. The developmental level of linguistic and operational explanations could be assessed through the complexity of the spatial associations. It was also found that literal associations derived from spatial analysis were often a pre-requisite for symbolic, analogous and psychological associations that were required for a more complex understanding of meaning. However, inconsistencies in assessment occurred because different cognitive theories and methodologies were used to assess vocabulary and operations i.e. lack of an integrated cognitive theory for assessing the use of vocabulary in relational judgements.

The application of the modal measure to the specific subject area of art (criticism) indicated that the assessment of the operational level of explanations could be used to co-ordinate the assessment of multi-logical responses i.e. hypothetical deduction, debate, problem solving. However, multi-logical responses were given in subject specific terms which required the identification of the underlying logical/cognitive functions. In addition the range of logical responses were limited to those that were relevant for processing subject-specific information i.e. mainly classification and hypothetical enquiry.

8.2. National Testing.

The study provided a methodology for relating artistic development to cognitive measures of learning development, which would be comparable with other subject areas for all phases of schooling. This was achieved though the use of a multi-disciplinary measure, which assessed the operational level of modes of reasoning though the use of explanations in art criticism. The study focused on the development of knowledge and understanding. However, art critical explanations involved the use of both practical and theoretical information which could be used to provide information about art critical development and assessment for the two attainment targets in art. Both included

- 1) a practical analysis of observations, ideas, feelings, techniques to criticise their own work for investigating and making;
- 2) a theoretical analysis of the construction of meaning through the artist's methods and intentions as well as stylistic and historical analysis to develop their own artwork for knowledge and understanding.

Therefore, the developmental matrix and measure provided information about the development of art concepts through three key stages, the different kinds of information required for key stage programmes of study and the appropriate assessment methodologies.

The study found that cognitive development in art could be assessed through the cognitive processes involved in critical evaluation . Cognitive development was defined in terms of the critical abilities that were required for describing, analysing interpreting and evaluating artworks. Critical abilities were assessed through concept analysis of the operational level of the underlying mode of reasoning employed in critical response. However, thematic, technical and contextual approaches employed different methods of analysing information which required the following different assessment procedures.

- 1) Utilitarian enquiry analysed the technical construction for thematic ideas which were assessed through literal and psychological associations;
- 2) Expressive enquiry analysed the technical construction for thematic feelings which were assessed through emotive/psychological associations;
- 3) Formalist enquiry analysed the technical construction for technical compositional unity which was assessed through technical associations;
- 4) Contextual enquiry related themes and formal compositions to their historical-geographical context which was assessed through thematic and technical associations with time and space.

In relation to delivering the National Curriculum the study provided information about the development of key art concepts in the form of a matrix of art critical abilities and a measure of three levels of development, with examples of levels of response for each ability. The information could be related to the kinds of skills knowledge and understanding required at each key stage for programmes of study along with questions for promoting critical development in art and methodologies for assessing end key stage attainment. However, the integration of the development and assessment of art critical abilities with the National Curriculum assessment criteria would require future refinement and simplification.

8. 3. Critical Thinking.

The findings indicated that critical thinking in art could be related to general critical thinking through reflective thinking. Critical thinking was employed in deductive and interpretative enquiry which included hypothetical thinking, debate and problem solving. Subjects used linguistic methods to analyse visual cues to provide informational support for the diverse methods of functional enquiry in art. There was evidence that subjects monitored their own thinking and used referential adequacy at three operational levels of development, although hypothetical thinking required the development of late concrete operations. The study provided information about strategy evaluation in art and methodologies for assessing critical thinking in specific subject areas, with the reservation that the modal measure would require adapting to the subject-specific methods of processing information.

8.4. Criticism of the Research Methodology.

The criticism of the research methodology focused on the sample selection and the three measuring instruments. The test scores from the schools samples, used to evaluate the measuring instrument, are shown in Table 22, and in Appendix X.

8.4.1. The Random Sample.

The randomness of the three schools samples, based on teacher selection, was confirmed by evidence of a normal distribution of test scores. The normal distribution of raw scores for each representative sample the modal test is shown in Figure 42. However, the small samples prevented generalisation of the findings to wider school populations.

8.4.2. The Piagetian Measuring Instrument.

The Piagetian measuring instrument consisted of three operational tests, which determined three operational samples. Confirmation of the operational structure of the art abilities and the operational measure was undermined by inadequate differentiation of the early and late concrete operational samples.

8.4.2.1. The Conservation of Area Test.

The modal and vocabulary scores indicated that the conservation test which determined the early concrete sample, was inconsistent. The conservation test

TABLE 22

THE PIAGETIAN, MODAL AND VOCABULARY SCORES FOR THREE SCHOOL SAMPLES.

1. THE TEST RESULTS FOR THE PRIMARY SCHOOL SAMPLE.

Sex	F	M	F	F	F	M	M	F	M	M	F	M
-----	---	---	---	---	---	---	---	---	---	---	---	---

Subject	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
---------	----	----	----	----	----	----	----	----	----	-----	-----	-----

Conservation.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
---------------	---	---	---	---	---	---	---	---	---	---	---	---

Rotation	0	0	0	0	1	0	1	0	2	0	0	0
----------	---	---	---	---	---	---	---	---	---	---	---	---

AAVT Score	37	45	32	37	43	37	48	31	40	42	44	18
------------	----	----	----	----	----	----	----	----	----	----	----	----

MORT Score	39	44	41	28	45	46	54	53	45	40	48	33
------------	----	----	----	----	----	----	----	----	----	----	----	----

2. THE TEST RESULTS FOR THE MIDDLE SCHOOL SAMPLE.

Sex	M	F	F	M	F	M	M	M	F	M	F	F
-----	---	---	---	---	---	---	---	---	---	---	---	---

Subject	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
---------	----	----	----	----	----	----	----	----	----	-----	-----	-----

Conservation	Y	-	Y	-	-	-	-	-	-	-	-	-
--------------	---	---	---	---	---	---	---	---	---	---	---	---

Rotation	1	3	0	1	1	1	4	4	5	4	4	5
----------	---	---	---	---	---	---	---	---	---	---	---	---

Formal Reasoning	-		-	-	-	-		LCO		LCO		LCO
		FO					FO		FO		FO	

AAVT Score	57	62	56	53	34	48	52	62	60	54	54	54
------------	----	----	----	----	----	----	----	----	----	----	----	----

MORT Score	45	54	55	51	45	49	54	55	57	44	52	53
------------	----	----	----	----	----	----	----	----	----	----	----	----

3. THE TEST RESULTS FOR THE UPPER SCHOOL SAMPLE.

Sex	M	M	F	F	M	F	M
-----	---	---	---	---	---	---	---

Subject	U1	U2	U3	U4	U5	U6	U7
---------	----	----	----	----	----	----	----

Formal Reasoning	FO	FO	FO	FO	FO	FO	FO
------------------	----	----	----	----	----	----	----

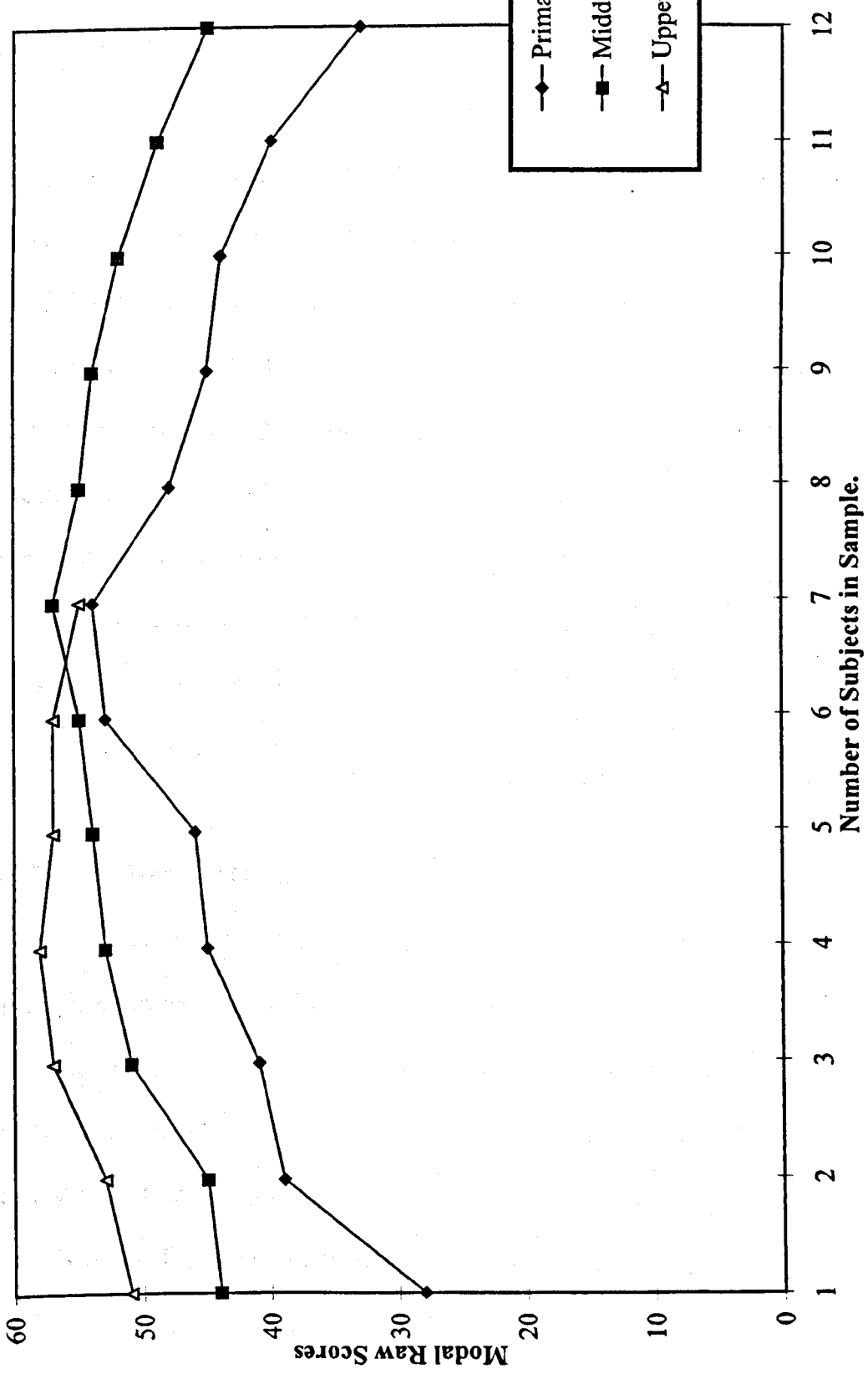
AAVT Score	67	65	68	68	68	69	67
------------	----	----	----	----	----	----	----

MORT Score	58	57	51	54	57	53	57
------------	----	----	----	----	----	----	----

AAVT Total Score 80.

MORT Total Score 60.

FIGURE 42. LINEAR GRAPH OF THE NORMAL DISTRIBUTION OF RAW SCORES FROM THE MORT
MORT FOR THREE RANDOM SAMPLES



failed to rate one subject (j3), but the modal and vocabulary test scores (Table 22) indicated early concrete levels of response. Higher bands of modal and vocabulary scores indicated two transitional subjects (j2, j11), and two misplaced subjects with formal operational scores for both tests, (m3) and a formal operational score for reasoning (j8).

8.4.2.2. The Projective Relations Test.

The modal and vocabulary scores indicated that the projective relations test which determined the late concrete sample was inconsistent. Four subjects with low projective responses had:

- a) formal operational levels of reasoning (j7), vocabulary (m1), both (m4);
- b) early concrete levels of vocabulary (m5).

Three subjects with higher projective scores had formal operational levels of response for vocabulary (m10), reasoning and vocabulary (m8, m12). In addition, low scores for the projective relations test, could be due to difficulties in understanding the complex test instructions.

8.4.2.3. The Formal Reasoning Test.

The formal reasoning test provided an accurate differentiation of the formal operational samples, as confirmed by the modal and vocabulary scores. The formal test included a differentiation of late concrete and formal operational levels, which provided an indication of transitional subjects (m8, m10, m12). However, the formal reasoning test was complex and time consuming to administer, and focused on male preferences. It was assumed that the logical

multi-factor measure of verbal reasoning, provided a better indicator of operational levels of development, than single factor measures (conservation, projective relations). Therefore, there was a need for multi-factor measures of verbal reasoning that provided differentiation of formal, late and early operational levels of development.

8.4.3. The Modal Measuring Instruments.

The modal measuring instruments consisted of a critical abilities test, and a modal measure. A main criticism of the modal measuring instruments was the mismatch between the related concepts format for the critical abilities test and the multi-functional cognitive phases for assessing art critical abilities. The different methods of organisation detracted from investigating the development of related concepts for each art function and a cross phase assessment for each function. However, the multi-functional organisation was flexible and could be organised to match the related concepts format for the critical abilities test or each art function.

8.4.3.1. The Critical Abilities Test.

The questions were found to be good promoters of three levels of response for art critical abilities. However, two questions for the ability to name items and make emotive associations with colour were found to be inappropriate. In addition, the questions were essential for differentiating between the four phases of art critical abilities, and defining contextual abilities. This was due to the difficulties in differentiating between descriptive, analytic, interpretive and evaluative uses of

information, and implicit use of time associations. The overlap of cognitive uses of information was assumed to be due to the ambiguous use of visual cues.

8.4.3.2. The Modal Measure.

The modal measure based on tautological, circumstantial and theoretical modes of thinking provided a good indicator of operational levels of thinking in art critical terms.

However, there were the following inconsistencies in the rating of operational levels:

- a) different levels of reasoning and vocabulary were rated according to the highest level of response;
- b) explicit comparisons with reality (like) were rated as late concrete operations, whereas preference judgements (like) were rated as early concrete operations;
- c) probabilities and hypothetical thinking could be given a late concrete or formal operational rating;
- d) borderline cases that could be rated at higher levels;
- e) the use of meta-cognitive criteria and relative thinking were rated as formal operations, despite the use of circumstantial information.

There were also inconsistencies in the cross phase assessment, which were due to subjects combining description with analysis, interpretation and evaluation.

However, the operational rating remained consistent, because responses were rated according to the tautological, circumstantial or theoretical mode of thinking.

Standardisation of the assessment of each phase would require greater

clarification of operational, cognitive and linguistic development. Inconsistencies in the assessment procedures were assumed to be due to the difficulties involved in combining operational and linguistic methodologies as described by Wood (1988).

8.4.4. The Allison Art Vocabulary Test.

The vocabulary test provided a useful independent measure of operational levels of development in art and for comparisons of levels of reasoning and vocabulary. However, there was evidence that minor adjustments were required in the level of some items. e.g. shading, shape, abstract. The combined analysis of modal and vocabulary scores provided good indicators of achievement in art.

8.5. Recommendations for Future Research.

The recommendations for future research focus on the clarification of the operational and linguistic assessment procedures for transfer to specific subject areas. These include:

- 1) the development of standardised formal reasoning tests to assess three operational levels of development as an alternative to conservation and projective relations tests;
- 2) enquiries into the relation between modal levels, and the cognitive development of vocabulary and reasoning for an integrated assessment;
- 3) clarification for interpretive enquiry of the role of:
 - a) relations in classification and analysis;

- b) generalisations especially to differentiate between complex and theoretical psychological associations;
- 4) clarification of the cognitive functions in art critical enquiry;
- 5) clarification in art critical enquiry of the relation between practical and theoretical critical thinking.

8 6. Summary.

The study concluded that the research had value for:

- a) developing objective measures that were appropriate for the arts by assessing the operational/modal level of explanations;
- b) the development and assessment of critical thinking in art by providing a theoretical framework that was relevant for National testing in art;
- c) relating critical thinking in art to general critical thinking and strategy evaluation through the cognitive style of thinking in art critical enquiry.

Therefore, the study provided a multi-disciplinary measure of the development of critical thinking in the arts and art education in particular. However, further clarification of the relation between cognitive linguistic and operational development would be required to standardise the measurement procedures. Recommendations for future research were based on clarifying the assessment of critical thinking in specific subject areas.

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